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EDITORIAL.

IT IS SATISFACTORY to note that the discussion on mine sampling continues to find echoes in distant regions. In a letter published in a recent issue of the *Australian Mining Standard* a thoughtful correspondent of that excellent journal asks for information concerning the manner in which mine managers in Victoria arrive at their estimates of ore value. He fears that they do it often merely by the aid of "dish prospects." As a matter of fact, the determination of average contents is done unsystematically at the majority of mines, and carelessness in this regard lies at the root of one-half the miserable fiascos that occasionally disfigure the business of mining.

IT IS RIGHT that we should acknowledge our indebtedness to Mr. Bennett H. Brough, whose Cantor lecture on 'The Mining of Non-Metallic Minerals' has proved such a mine of useful information, of which we have taken advantage to obtain 'Metallics.' We compliment Mr. Brough on the value of the pamphlet edition of his lecture, as published by the Society of Arts, and trust that his useful labors will bring forth further fruitful literature of the same kind.

THE STATISTICS of British iron and steel production, given on another page, show that, while the output of the United Kingdom increased in 1903, the quantity of pig iron made was less than that of Germany, while the steel was very much below the German figures. Great Britain adheres more than any other prominent iron-making country to the manufacture of wrought, or puddled, iron, which has been so largely replaced by steel in this country and in Germany. The iron industries, notwithstanding the moderate increase shown, were generally prosperous last year.

IT APPEARS probable that California will take the lead in the manufacture of fuel briquettes in this country. In addition to the briquette plant now in operation in that State, a second is under construction, and plans have been prepared for a third. These plants will use lignite as a basis, with asphaltum pitch as binding

material. Investigations are also being made as to the commercial possibilities of making briquettes out of the residuum from petroleum refineries.

LE NEVE FOSTER.

It is with infinite regret that we learn by cable, at the moment of going to press, that Clement Le Neve Foster has been suddenly called across the range. His forthcoming visit to this country, in connection with official duties at the St. Louis Exposition, had been anticipated by the many friends whom he possessed on this side; his recent knighthood; his endeavors to bring about a remodeling of the Royal School of Mines; the publication of his new text-book on 'Mining and Quarrying'—all these had brought him prominently and pleasantly before the members of the mining profession. Active in spirit, full of useful energy, a thorough scientist and an excellent teacher, Sir Clement Le Neve Foster passes from our ken with a feeling of sorrow, the heaviness of which is lightened by the heritage of a good example and a memory that will stimulate our best endeavors.

MINE VENTILATION.

Our esteemed contemporary, the *Australian Mining Standard,* tells of "an interesting experiment with a view of improving the ventilation" made at the New Chum Railway mine, Bendigo. This experiment consisted in repeating the attempts to cool certain hot places by means of water sprays and ice in the manner which Mr. John A. Church lately pointed out was so futile when tried in Alpine tunnels. A winze on the 3,000-ft. level is down to the depth of 3,771 ft. and a raise to connect with it was started from the 3,856-ft. level. The temperatures given are interesting. On the 3,856-ft. level at the station it was 92° F. and at the raise, which is in a crosscut 400 ft. distant, it had increased to 98° F. Water to the amount of 11,200 gallons per shift being sprayed, apparently in the raise and against the walls, the temperature in the raise was reduced to 92° at the top and 90° at the bottom. This reduction of temperature does not seem to have been very reviving to the men, for another experiment was made by putting 4 cwt. of ice "at the entrance to the raise." From the short note of our contemporary we judge that this effort to improve the condition of men working in a hot place by loading the atmosphere with moisture was a failure, as it was bound to be. If the Comstock system had been used and the air of 92° temperature at the station had been blown through a pipe in the cross-cut it would have reached the men at about 98° and been a much more efficient cooling agent than the saturated air. Mr. Church explained the theory of the Comstock practice, but the practice itself is an object lesson entirely apart from theory. While the big bonanza mines were in full swing about 2,700 men were kept at work by this means in temperatures that were often 20° to 30° higher than those in the Australian mine, and afterward in deeper levels men were enabled to support such a heat as 174° in places, though we do not say that under such conditions work can be pleasant or profitable.

In one respect this Australian episode is valuable. It shows that in the world-wide expansion of mining the experience of the Comstock mines, then almost unique, may be repeated any day and anywhere, and that probability makes the Comstock example and our discussion of it of great importance.

THE HARWICK MINE ACCIDENT.

The verdict of the coroner's jury that investigated the frightful disaster, whereby 178 men and boys lost their lives at the Harwick mine on January 25, is something of an anomaly, in that the jury did find some one to blame, putting the responsibility on the superintendent of the mine and the district mine inspector. This, in a way, is commendable, even though the coroner's charge to the jury—an abstract of which is given in our news columns—apparently showed ignorance or prejudice, since the testimony at the trial made it clear that the mine atmosphere was not what it should have been.

Whether the district mine inspector should be held blamable is altogether another matter. He had been at the mine in November, the law requiring an inspection every three months, and saw nothing wrong. It is certain also that in a gassy mine, working coal containing considerable volatile matter, conditions may change from safe to dangerous within a very short time; hence, had the inspector done all that the coroner said ought to have been done it does not follow that conditions on the fatal day would have been different. Chief Inspector Roderick's criticisms of the coroner are grave. The mine inspectors of Pennsylvania, as a class, have been men of good reputation, and if special attempts were made from purely personal motives to fix the guilt on Inspector Cunningham, the public is entitled to the evidence. Possibly the inspector had displeased some labor-union.

The guilt of the mine superintendent is also open to question. The fire-boss, who, under the State law, has great authority, had examined the workings and reported them safe. This is the important point, not whether ice had accumulated in an air-shaft. Neither is the fact of any moment that compressed air was allowed to escape into a chamber, since this method of preventing a dangerous accumulation of gas is in use, more or less, the world over. It does not appear that the superintendent had reason to doubt the ability of the fire-boss, though, of course, the explosion proved that there was a dangerous mixture of dust and fire-damp in the mine air. Possibly the superintendent had failed to take all the precautions he might have taken to minimize the danger from dust; possibly the company had not acted on his recommendations; these are points which we do not attempt to discuss, not having the testimony at hand.

It is simply fair to the two men under arrest to say that the coroner's charge was neither temperate nor judicious; in fact, it reads in places like some so-called editorial in a yellow newspaper. Yet the fact remains that 178 lives were lost, and the conditions that made such a calamity possible were, in part as least, preventable. The Harwick disaster was not an act of Providence, mysterious and not to be foreseen. Somebody was to blame.

EQUIPMENT AND ORE RESERVES.—II.

As yet there has been but little discussion of the interesting article by Mr. H. C. Hoover on the subject of the proper ratio of mine equipment to ore reserves. Mr. E. G. Spilsbury, in our issue of March 31, and Mr. B. B. Lawrence, in this issue, agree in their opinion that American mining rarely affords conditions warranting such a nice adjustment between the ability of the mine to produce ore and the capacity of the mill to consume it. Owing to the uncertainties of the one and the positiveness of the other, it seems, from their point of view, best to err on the safe side and erect treatment plants, which are well under the probable production. A manager, of course, likes to have something up his sleeve; it is better from his standpoint to have an accumulating ore reserve underground than to hang up ten or twenty stamps; he would rather have ore lying broken in the stopes than shut down a part of the cyanide plant for lack of an adequate supply. But, as a matter of fact, the capacity of the initial plant is usually ahead of the rate of development, and as soon as there is evidence that the two approach each other the owners call for an increase in the reduction works, because they want to rush the output. The American idea is to secure certain and immediate profits at the expense of ultimate possible economy. While the engineers may appreciate the benefit of plans which purpose the amortization of capital, and though they may be fully awake to the economy of a proper balance between the capacities of the mine and mill they are brought abruptly against conditions which completely upset any logical solution of the problem. The owners refuse to take a far-sighted view, and prefer a plan of operation which results in immediate profits; therefore the manager has to adjust his point of view to theirs; he is confronted by a condition, not a theory, and adopts a policy which is practical, though short-sighted, which hugs the brutalities of fact while it disregards the attractions of system; it is the inevitable consequence of a short-lived ownership of mines.

For behind all the arguments for and against an enlarged mill capacity or an increase in mine development there stands, frank and unashamed, the essentially American idea, that it is a poor business to mine for posterity. "What has posterity done for us?" the cynic asks. "Let us take short views of life—and mining; why inaugurate a policy the benefit of which it requires years to work out while the expense of it burdens the present?" In this connection "posterity" means successors in any form, whether it be shareholders, who five years hence may have acquired the holdings of the present proprietary, or whether it be the engineering staff—general manager, mine superintendent and shift bosses—who, likely enough, will in the course of time, or with change of control, succeed the existing management. Mines get bigger or smaller; people make as much money by selling out of them as by buying into them; there is a healthy growth or a steady decadence; nothing stands still in an intensely active and pushing community, such as an American metal-mining district. In the coal regions it is different, fixity of ownership is more prevalent and a consistent policy has an opportunity to justify itself. But in the West, it is a fact that the control of mines passes, as a rule, in less than five years, and the manager is changed on an average about every two years, either because a better position is offered to him, or because a better man is found for the position, or for any one of the several reasons which bring about new appointments to such posts of responsibility.

Tangible profit is the aim of the American system, or the excuse for the want of any system; sometimes that means a mill with a capacity per annum equal to the total ore reserves, sometimes it means no mill at all, but the disposal of the output to custom mills and smelters; sometimes it means no mill and no production, but merely a preparation of the mine for a sale; in each case the object in view is the making of the most money out of the property in the shortest time. The method has the faults of its virtues.

While the foregoing is believed to represent current practice in this branch of mining economics, we realize fully that there is a large number of well-organized mining proprietaries which operate mines with no view to exhausting them or selling them or the shares in the companies controlling them, and which therefore adopt a system in which amortization of capital and other nice adjustments are recognized factors. Taking a broad view of mining activity, the description given above will nevertheless be recognized, we believe, by those who are best informed to be a fair statement of the case, the discussion of which presents many points of view.

This subject is of great practical importance to the business of mining, and we trust that some of our experienced engineers will ventilate their views in our columns.

LARGE BLAST FURNACES.

Recent discussions on iron blast furnace practice, together with some results of experience, indicate a tendency among engineers to the belief that expansion in size has been rather overdone. Some do not hesitate to say that the stacks of 500-ton daily capacity, which have been built during the past two or three years, are not quite fulfilling expectations. Others, there is reason to believe, hold much the same opinion, though they may not be quite ready to express it publicly. We do not mean to say that opinion is unanimous, for there are many who still believe in the big producers. There is no doubt that they have been successful, so far as quantity is concerned. Economy is another matter, and upon that point the question generally turns.

The arguments against the large stacks are that they consume more fuel per ton of iron made than the smaller furnaces; that only the best quality of coke can stand up under the heavy burdens; that they are more liable to slips and explosions, and that the quality of iron made is less uniform.

To take these charges in reversed order, the last one may be dismissed at once, since there is practically no evidence to support it; and practically, also, no reason for it, if we except irregular charging and inefficient management, which are as likely to affect small furnaces as big ones. The third charge seems, from all the evidence that can be collected, to have some foundation. In the nature of the case it looks probable; though it may be due in part to the fact that the very large furnaces have been experiments, and there are questions of proportion, slope of walls and the like, upon which the best authorities differ, and which can be decided only by experience. The point upon which experts seem most nearly united is that there has been a tendency to excessive height of stack and that, in all probability, a furnace 80 ft., or 85 ft. in height would work more smoothly, and with less tendency to accident, than one 100 ft. high. This also affects the coke question to some extent, since a reduction in height means a reduction in burden.

The extended use of fine Mesabi ores also finds an important place here. Only a short time ago, when most of the big furnaces were designed, Mesabi ores made up from 25 to 50 per cent of the charge. The proportion of fine ores have gradually been increased until some very large stacks are now running upon such ores exclusively. As the Mesabi range is now that part of the Lake Superior region which is increasing its output, it is evident that furnaces must continue to use these ores in large proportion, if not entirely; and they must be designed and built accordingly.

The comparative consumption of fuel per ton cannot be determined until we are in possession of exact data relating to the performance of some of the large furnaces; and such figures have not been made public. That there is a saving in first cost, and therefore in interest charges, and also some economy in labor, is generally admitted. Whether these points will offset the increase in coke consumption can only be decided, as we have said above, when complete data are accessible.

At present no very large furnaces are under construction, or planned. This is due ,however, chiefly to the lull in the iron trade, which does not encourage new undertakings. Whether any more 500-ton furnaces will be built in the near future, is a question involved in some doubt. It is quite possible that straining after large quantities in production may have somewhat passed the limit, and that when new building starts up again we may see some reaction in favor of furnaces of more moderate size, especially if Mesabi ores retain their present prominence in the supply, as they are pretty sure to do.

MARKET CONDITIONS.

April 20.

The metal markets generally have been rather quiet, with only few changes and a moderate amount of business.

Copper has about held its own, with some sales and some inquiry for future deliveries. Lake spot is rather scarce, owing to the delay in shipments from Michigan. The foreign market is apparently supplied for the present.

Tin is slightly lower, having been somewhat affected by the dullness in silver. The demand continues fair.

Lead is unchanged, with about the usual consumptive demand.

Spelter is slightly easier, and galvanizers' requirements seem to be falling off. The Joplin ore market shows little change.

Silver continues dull, with few changes in price, and a continued light Eastern demand.

The iron markets are reported quiet, showing a reaction from the activity of the past few weeks. Few new orders are reported, either for raw material or for finished products. There is little inquiry as yet for deliveries beyond June.

The iron ore question does not seem yet to be fully settled, as the meeting on April 19 did not result in a satisfactory way. There will, however, be some reduction in ore prices, but hardly a free market. The probability is that the demand for the coming season will hardly permit much competition.

The Western coal markets are dull, chiefly owing to the delay in the opening of the lake trade. At present most local markets are overstocked.

The Atlantic seaboard bituminous trade shows little change, the supply of coal arriving at tidewater being generally ample for all demands, and the market is rather quiet.

In the anthracite trade heavy buying to take advantage of the April discounts prevails. Retail demand is heavier than usual at this season of the year, owing to cold weather.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

About 35,000 tons of tin scrap are treated electrolytically every year in Germany, yielding 2 to 2.5 per cent (about 800 tons) merchantable tin.

Thermometers are now being made from fused quartz, measuring 35 cm. in length. The nickel steel scale reads from 300° to 750° C., each division representing 5° C. Thermometers filled with mercury and nitrogen, under a pressure of 60 atmospheres measure temperatures up to 720° C., with exactness.

Fire-proof wire, suitable for electrical conductors, etc., is insulated with a fine, even web of asbestos, coated with cement. This porcelain-like covering is very strong and flexible, and has other good qualities, such as its resistance to heat.

Gem garnets of rare beauty have been discovered in the Cowee valley, in North Carolina, the yield in 1901 being 200,000 carats, valued at $20,000 after cutting. In the same year the United States produced 4,444 tons of garnets for abrasive purposes, valued at $158,100, mined principally in the vicinity of Ticonderoga, New York.

In South Africa garnets are a by-product in diamond mining, and the expansion in the industry has caused the abandonment of nearly all the Bohemian mines, which for many years supplied the world's markets.

'Palagonite,' originally the name of a stone found in Palagonia, Sicily, has been discovered in quantity in Southern California. It is used for making pigments, talcum powder and as an ornamental stone for the interior decoration of buildings.

Emery, the common form of corundum, is an important abrasive, found principally in Asia Minor, Greece, and Canada. The world's consumption is about 25,000 tons annually.

The 'cat's eye' set in jewelry, is sometimes chrysoberyl, a beautiful greenish-yellow precious stone of great rarity, which occurs in the form of rolled pebbles in Brazil and Russia.

The transparent moonstone, mined in the Kandy district of Ceylon, the apple-green amazon stone, the Norwegian sun-stone, and the iridescent labradorite, are forms of feldspar owing their value as ornamental stones to certain effects of light.

Agate is the banded variety of chalcedony; when the bands of color lie in even planes, it is termed onyx; or, with alternating bands of red and white, sardonyx. All are ornamental stones.

Approximately 83,420,135 carats, or about 17 tons of diamonds have been produced from their discovery to the end of 1901.

THE TRAINING OF TECHNICAL CHEMISTS.*

By J. B. F. Herreshoff.

It seems a great mistake that the term 'technical chemist' has been used in connection with chemists who are obliged to apply chemistry in manufacturing processes. It would have been better had they been called chemical engineers, for this might have induced the study of chemical engineering in the colleges many years ago. I feel certain that, had this been done, our industrial situation would have been much further advanced than at present, and the standing of practical chemists would have been higher and their value more highly esteemed than is the case. We do not speak of a metallurgist as a technical metallurgist, a miner as a technical miner, or an electrician as a technical electrician. The metallurgist is, properly speaking, a metallurgical engineer, the miner a mining engineer and an electrician who applies electricity, an electrical engineer. In all of these positions it is impossible to succeed without a full knowledge of mechanical engineering. The same is true in the application of chemistry. It would appear that when young men aspired to become chemists they looked upon the great chemists as supreme beings. They also considered mechanical engineering, with its machinery, machine shop, foundry, etc., as beneath the dignity of the chemist; they left college knowing nothing of mechanical engineering, and of course were totally unfit to take positions as works managers or wherever it became necessary to apply chemistry in a large way. I have known cases where young men, who were exceedingly clever as chemists, but totally ignorant of engineering and as unpractical as one could imagine, were placed at once in positions of practical responsibility in small chemical works. No more cruel act could possibly be done to the chemist. The business managers were not practical and had studied neither engineering nor chemistry. Of course many of the chemists who were placed in such positions proved utter failures, and for this reason many of the practical business men twenty-five years ago doubted the value of chemists in connection with manufacturing. Had these young chemists been chemical engineers, and had the business managers received a moderate education in mechanical engineering and chemistry, the combination would have resulted in a marked success instead of failure.

When we notice the enormous field in manufacturing in this country one can not help feeling that the study of mechanical engineering should be very much more general than at present. I have known chemists who had not studied engineering, who, when placed on practical work, realized their deficiencies and took a course in mechanical engineering at night schools in order to enable them to properly apply their chemical knowledge. After men have gone through a regular course in chemical engineering they should be trained, as far as possible, before leaving college, in a thoroughly practical manner in the application of chemistry as well as in examples of engineering problems.

The greater the application of chemistry, the more important becomes the combining of mechanical training with chemical training. Our colleges should consider this matter more seriously than ever, and do their best to make the course in chemical engineering as complete and perfect in every way as possible. This is a duty they owe to our young men who desire to make a success in the great field of chemical engineering; it is a duty they owe to the manufacturers of this country who are doing their best to rival successfully the highest European competition, and obtain our full share of the markets of the world for our manufactured products. Many of our manufacturers would receive the highly educated chemical engineer with open arms, and as a proof of their earnest belief in the importance of this matter they would gladly make necessary endowments to assist the colleges in carrying out this important work. The colleges should court their assistance by receiving all the practical suggestions that would enable them to readily turn out men so well educated and trained that they would very easily become valuable chemical engineers.

Chemical engineering necessitates a greater variety of engineering than all the other branches of engineering combined. In designing the apparatus that is employed in conducting the endless variety of chemical and metallurgical processes, every known metal and alloy is used in every conceivable variety or form. All kinds of brick are used, acid, basic, neutral and vitreous, glass, all sorts of potteryware, porcelain, stone, rubber, coke, asphalt, wood, cement, etc., and these in every combination and form which the best chemical engineering skill can devise to improve old methods and properly conduct new processes. In order to select the best material with which to carry on difficult problems, the chemical engineer must have a wide knowledge of the action of acids, alkalies and chemicals under all conditions of solutions and heat, upon all known substances which could be employed to carry on the processes. Generally in new problems, carefully conducted investigations have to be made on a small scale, to show conclusively the best substances to be used.

*Abstracted from 'Science,' from a paper read at the meeting of the New York Section of the American Chemical Society, February 5, 1904.

Many ingenious processes have been developed for intensifying the oxidizing action of air on metals by submitting the latter to reaction in the form of a finely-divided spray. The latest proposal, that of M. Harmet, has for its object the treatment of cast-iron, producing a refined iron or steel. Molten iron is caused to flow through a fine channel surrounded by an annular air-blast which thus forms a tuyere, driving the metal forward in a fine spray. The spray is collected and allowed to flow together again in a receiving chamber, from which the molten steel can be tapped.

Some large gas producers of the Duff type have recently been erected in Great Britain. Among these is one at the Armstrong-Whitworth Works, at Manchester, in which 1,200 tons of coal a week are converted into gas with recovery of sulphate of ammonia and other by-products. Another one of about the same size is being put up at the Beardmore shipyards, at Dalmeyr. This producer will convert about 1,200 tons of coal a week into gas, which will be used to drive gas engines of 8,000 aggregate horse-power. These gas engines drive dynamos, which will furnish power to the yard.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

RE-GRINDING MACHINERY.

The Editor:

Sir.—I have been greatly interested in the valuable notes contributed by Mr. Schwerin under the above heading, and from my own experience can endorse most of his conclusions.

Rolls are sometimes preferable, because of the minimum proportion of slimes produced; but their capacity is small when fine crushing—under 20 or 30-mesh—is necessary. Moreover, unless the entire product is made to pass through a screen of finer mesh than the smallest particles of the feed, the same objection which Mr. Schwerin raises to Krupp mills for re-grinding for subsequent concentration applies to rolls in even greater degree—that much of the material passes through without any re-crushing at all.

Huntingtons slime less than Chilean mills, and for a friable ore are preferable; but with a hard and tough gangue they often fail to pulverize, making a large proportion of rounded gravelly particles.

The Chilean mill—of which I have had experience only with the Monadnock type, built by Messrs. Trent—is the most widely useful machine I know of for moderately fine re-grinding. One of its drawbacks, to which neither Mr. Schwerin nor Mr. Trent alludes, is the variation in product and output as die and rings wear down: in the former case owing to increasing height of discharge, as in a stamp-mill; in the latter because of lessened weight of mullers. This variation cannot be closely controlled by changing the screen-mesh; and is only partially obviated by care in keeping the scrapers close to the die.

The same point which Mr. Schwerin notes with Huntington mills—irregular wearing of rings and dies—often applies in less degree to Chilean mills. I agree with Mr. Trent that the Monadnock mill can successfully reduce comparatively coarse feed to any desired mesh at one operation, without proportionately reducing capacity; so can the Huntington. I doubt, however, whether 2 to 3-in. sizes can be fed with advantage, as this results in undue strains on running gear and foundations.

I am disposed to think that the importance of gradual reduction—the cracking of each grain once only—is often over-rated. The carrying of this ideal into practice sometimes results in the circulation round and round, in trommels and elevators, of a great bulk of middlings, the more friable (and usually the richest) constituents of which are often literally worn away. It will frequently pay better to re-crush a little finer, at one stage.

Similar experiments to those of Mr. Schwerin in really *fine* grinding—below 100-mesh—of hard ores would be valuable. In the case of the Cornish tin-ores, for instance, much of the mineral is often not liberated without very fine grinding. For this work, in my time, the Stephens-Toy pulverizer was largely used; a machine obviously modelled on the pans used in pan-amalgamating. This machine held the field, notwithstanding its heavy costs in power and repairs. For such extremely fine grinding, there was obviously reason for the local use of discharge by 'flush' in place of screens. Possibly the Gilpin county burr-slot screen would have answered.

In some recent laboratory experiments in the concentration of a wolfram ore, I found that only a very imperfect separation could be effected without crushing to 80-mesh; and even after re-grinding to 100-mesh there was a considerable proportion of middlings which needed still finer grinding. Nothing short of the re-grinding such as is done by the Cornish 'streamers' on the Red river and elsewhere would have liberated this mineral so as to permit of a clean product being obtained.

GEORGE E. COLLINS.

Denver, April 9, 1904.

CYANIDATION IN COSTA RICA.

The Editor:

Sir.—In the preparatory treatment of material for cyaniding there is great diversity of practice. For example, in the treatment of sand after stamping and amalgamation, it is claimed in a few instances that the net results from 'direct-filled' vats were better than those from 'intermediate filling.' On the Rand, the treatment of sand by 'intermediate filling' is practically universal. In California (notably at Bodie) and in Nevada both 'direct' and 'intermediate' filling have been tried and failed; and it was found in these instances profitable to run the tailings into a reservoir and to give them a thorough 'weathering' and preparatory treatment by ploughing and harrowing before charging them into the leaching vats.

The improvement in the results by this last method of treatment has been generally ascribed to the improved physical condition of the sand, and more even admixture of sand and fines. These conditions, of course, have an influence, but I think that the drying of the material is of more benefit than any other condition. Our work here at the Tres Amigos mill has proved that it was commercially impossible to get an average extraction of more than 65 per cent from material assaying $10 per ton which was charged into the vats in a wet condition. The same material, after being dried only (great care being taken not to roast at all) gave an extraction of 88 per cent in the same time.

Further, old tailings which had been collected in a dam and 'weathered' for a couple of years or so, gave an extraction of 90 per cent to the same treatment. In this case the improvement in extraction was not due to the elimination of the sulphides by oxidation, as the tailings still contained about the same quantity of 'concentrates' as the fresh tailings. Judging from the results of the old tailings from the dam, a plant was put in to treat the tailings direct from the 20-stamp mill. Diagonal slot screens of about 30-mesh were used in the batteries, the pulp after passing the plates going through a couple of pointed boxes to separate the slimes. These boxes worked very inefficiently and required an enormous amount of water to make them work at all. In my experience, a good concentrating table, such as the well-known Wilfley, is much superior to any pointed box arrangement, as it makes a clean separation of the sand and slime without using much water. The sand was then collected in catch-vats and, after being drained as much as possible, was charged into the leaching vats. Unfortunately the plant was so arranged that only two catch-vats could be discharged into one leaching vat, and as the capacity of each leaching vat was about 80 tons, while that of each catch-vat was 20 tons, each of the last had to be filled twice to get enough sand for a charge in a leaching vat. In consequence of this the sand could not be properly drained, but had to be charged into the leaching vats in a wet condition. The results were most disappointing, the extraction being very low. I was sent to investigate the trouble and take charge of the plant. After the correction of minor faults in the treatment, the fact of the low extraction under the conditions then obtaining at the plant was proved. By using finer screens on the batteries and draining the sand as thoroughly as possible, the extraction was considerably improved. An investigation of the tailings before cyanide treatment and of the cyanide residue showed the following facts:

It was found that the concentrates (which constituted about 2 per cent by weight and 20 per cent in value of the tailings) only yielded about 50 per cent of their values without further crushing and required grinding to the finest slime before a fair extraction of 90 per cent and over could be secured. The coarse sand (retained on a 40-mesh screen) yielded also only about 50 per cent of the gold contents. The fines yielded easily an extraction of 85 per cent.

From the foregoing it is evident that a fair extraction could be made on the sand by simply giving it a good drying before treatment and that fine crushing would yield a high extraction.

This short article has not been written with the view of giving any full description of the treatment of the ore here, but to draw attention to the effect of wet crushed material in cyanide treatment. It would appear that in wet crushing the coarser particles of ore have all their minute seams and cracks, etc., filled with water, which in presence of sulphides (especially pyrrhotite) becomes de-oxidized. The extraction of the gold from such a material is so greatly retarded as to render the treatment impossible. This difficulty can be overcome by very fine grinding, but it is questionable whether dry crushing would not be in many instances preferable.

The following note on the amalgamation of the ores of this district may be of interest. The ores that have been treated so far are all what is called oxidized, though containing a certain amount of pyritic material and contain a quantity of acid which, while always considerable, is variable in quantity. The sand required from 10 to 13 lb. of lime per ton to neutralize this acidity. The attempt was made to add the lime in the battery, but I found (as others have done who have tried it on this continent) that the addition of the lime there interfered greatly with the amalgamation. It was apparent then that with this type of ore amalgamation takes place most readily in presence of acid. It is noteworthy that at some of the mines near here groves of lime trees were planted and the statement was made to me that the limes were used to assist the amalgamation. Whether the lime juice was of more direct benefit when used in the mortars or when used to refresh the amalgamator, I do not know, but it would be of at least as much use in the mortar as a quid of tobacco in an amalgamating pan.

BERTRAM HUNT.

Costa Rica, March 23, 1904.

RICH PORTIONS OF VEINS.

The Editor:

Sir:—Much has been written of late years concerning the origin of ore-deposits, and those who have made the results of their observations and investigations public deserve the thanks of mining men. There is, however, one very important side of the question from a miner's point of view which is often only incidentally mentioned, and that is what causes the richer portions of veins; as, after all, it is the payable parts of a vein that a miner seeks, for one seldom finds the whole of a vein worth taking out, though nowadays, with improved methods, we can afford to work what a few years ago would have been left standing.

Those who have made a special study of ore-deposits must have come across many interesting facts bearing on the reasons why ore is richer in one part of a vein than in another, which facts may be utilized to guide one in locating the richer parts of veins and possibly to obtaining a fair idea of their extent. A discussion on the subject of primary concentration in veins by such observers, would, I am sure, be of interest to your many readers.

Three things are necessary for the formation of the rich parts of veins: The metal-bearing solution, the place in which the ore can be deposited, and the precipitating agents. Presuming that the solutions which originally find their way into fractures of a rock in a given place are fairly uniform, why should ore accumulate in certain parts of a vein in preference to others? Various theories have been proposed, and all the causes suggested may have helped in a greater or less degree, and in one combination or another, for we cannot expect one cause to account for all cases. Interesting and important as secondary enrichment may be, and although it may indirectly throw light on the subject, yet this is really outside the point at issue; while the richer portions of a deposit due to magmatic differentiation appears to be one simply of degree.

When an ore is found to favor one kind or variety of rock in preference to another, such as the black slates of Gympie, Queensland, in which alone the reefs are productive, they being poor or barren when passing through the other rocks, one is apt to look for some substance in the rock, such as graphite, likely to precipitate the gold, though even in the slates the reefs are not equally rich. In other well-known cases veins are only productive when in certain varieties of limestone, granite, etc.; or the metallic contents of a vein may largely change with the nature of the rock through which it cuts. Besides the influence of some substance in the rocks that acts chemically in the solutions, precipitation may be assisted by the varying power that different rocks have to conduct away heat; or one rock being more porous and jointy than another may act as a relief valve to the imprisoned waters and reduce the pressure.

In ordinary veins, it has always struck the writer that one should study the physical rather than the chemical conditions when searching for shoots of ore, and that the key of the situation rests with the passage along which the solutions have circulated. We often find deposits of ore where two veins cross which have caused a shattered pipe forming a natural channel for the ore-bearing solutions, such as at the Milburn Creek copper mine, N. S. W. Solutions travel along such pipes readily because being larger than the veins that caused them, there is less resistance; besides which, surface waters tend to find their way into main channels and help to cool the upward flowing solutions; thus two important precipitating agents are present, a reduction in pressure and temperature, to say nothing of salts in solution dissolved near the surface that will react on the salts brought up from a greater depth, or of substances in the wall rocks that have a similar effect. Again, let us take the rule for determining the pitch of a shoot in a vein which cuts through sedimentary beds by noting the line of intersection the vein makes with the dip of the strata. I have never known this rule to fail; on the contrary, I have seen instances where shoots in the same vein have pitched in opposite directions with a change in the direction of the dip of the strata. The reason why the shoot takes the direction of the line of intersection is no doubt because a more persistent channel was made in that direction, thereby allowing a greater volume of ore-bearing solutions to travel along it. In wide veins we often see indications of end pressure showing themselves in undulating partings of considerable extent, especially in the shallower workings; where circumstances permitted, I have generally noticed that the richer portions of the lodes take the same direction as these curves.

When there is a natural water-channel of any extent, caused by a big fracture in the rocks, we find several exits forming a series of springs, the greater bulk of the water finding its way through those passages that are most open; the rest of the fissure is also full of water, but the circulation in it is comparatively slow. Where the greatest bulk of the solution passes, and with it the greatest amount of mineral matter, is, therefore, the place where most ore is likely to accumulate. There may be a period when the flow is so strong that a passage becomes scoured and the deposition of ore is prevented from taking place; but a time will eventually come when the rate of flow is diminished, and then ore can deposit, even in narrow channels if sufficient mineral-bearing solution circulate through them; so, although we generally find the richer parts of veins in the wider portions where the flow has generally been greatest, unless the space was choked with debris from the wall rocks, still there is nothing unreasonable in finding rich ore in narrow parts also, if such narrow part has been a portion of the main exit, and has not been isolated or partly cut off by the walls of the fissure coming together and causing the enclosed solution to become almost stagnant. The great surface offered by pieces of rock occupying the wide parts of fissures also assists precipitation by supplying a surface and causing the rate of flow near them to be less, owing to friction. We often find the ore of veins confined to the walls, presumably for the same reason, the centre of the vein being filled up with gangue often contributed by the wall rocks as the flow diminished, though when a fissure has been re-opened by subsequent earth movements, ore-bearing solutions may again deposit their burden. The reason why miners can so often tell when they are approaching an ore-shoot by a change in the country, is doubtless on account of the effect large volumes of solution have had on the wall-rocks, and under the circumstances they would penetrate further than when the channel was constricted.

In some cases we find that the productiveness of a vein varies with a change in strike or underlie. This again suggests that physical reasons may have affected the richness, probably obstructions in the underground current. That veins have been re-opened at various periods, during which solutions of different metallic contents have passed through them, explains the change seen in the contents of a vein.

By giving first place to the physics of veins, it is intended to draw attention to the fact that an ore-bearing solution would be of no commercial value unless the physical conditions were such that the ores could be deposited in payable quantities; and although these conditions would be of no value without the ore-bearing solutions, yet in searching for shoots of ore we have more to go on by studying the physical features, than in studying the chemical side of the question. We find certain ores under certain conditions, because that form was the most stable under existing circumstances. As we do not know certainly the composition of original metal-bearing solutions, and other necessary factors, there must, of necessity, be a certain amount of assumption as to what reactions have actually taken place, in order to form the minerals we find. The chemical side of the question—why particles of the same nature segregate together in large bodies, and other points affecting the formation of rich parts of veins, are important, and should not be neglected, though they may not be of direct assistance in guiding us to these rich bodies.

FRED'K DANVERS POWER.

Sydney, N. S. W., March 7, 1904.

MINE EQUIPMENT AND ORE RESERVES.

The Editor:

Sir.—Mr. Hoover's paper on 'The Economic Ratio of Treatment Capacity to Ore Reserves' upon which you have invited criticism, has received my careful consideration. I have also read with interest your editorial upon the subject of 'Equipment and Ore Reserves.'

In my experience in precious metal mining in the United States it is the exception to find a mine which shows anything like the ore reserves necessary to carry out any such plan as suggested by Mr. Hoover. I might venture to say that there are very few mines, unless they are for sale (or fixed up for a sale) which have any substantial ore reserves ahead to enable one to think of "amortization" or "increment of profits." These terms, it seems to me, are all right in the manufacturing business, but I doubt very much the wisdom of using them in regard to precious metal mining. Hand-to-mouth methods are the rule, and we must unfortunately adapt ourselves, our plans, etc., to conditions as they exist.

I notice that you are obliged in a footnote to explain to your readers the meaning of "amortization." This in my case—I blush to confess it—was most necessary, as I have never had occasion to use this term in the every-day business of mining. Mr. Hoover says that "the increment of profits for 18 months was sufficient to amortize the expenditure." Why not say "offset" the expenditure? Of course I shall bring down on my head a severe criticism as to the views which I have expressed in regard to Mr. Hoover's article; but it does not seem to me clear, nor does it appeal to my common sense, as applied to precious metal mining in this country.

B. B. L.

New York, April 8, 1904.

THE MANAGEMENT OF AUSTRALIAN MINES.

The Editor:

Sir.—The letters published in your issue of January 14 from Mr. J. H. Curle and the *North Queensland Register* open a question on which there is a great difference of opinion in some mining districts in Eastern Australia. The quartz miners in Victoria and Queensland say: "By working the mines the way we do they pay dividends and if we worked them more elaborately and went in for a larger staff and reported assay-values and details of costs they would only pay salaries."

This is true in a great many cases, but not in all, and there are a number of mines where a more systematic method of management would greatly increase the shareholders' profits. The methods which Mr. Curle criticises arose in the early days of quartz mining in Australia when the mines were richer and more patchy than they are now. Then so little was known about the more modern practice of mine sampling that whenever sampling was attempted it was done in so haphazard a way that the results were never confirmed by the battery returns, and so sampling was scoffed at, nothing being believed except battery returns.

On the smaller mines to-day in Victoria and Queensland the mine manager has to fill a multitude of billets. He is often the assayer, surveyor and mine accountant and has therefore no time for the details which are necessary for the proper record of development work. He reports to what is called the 'legal manager,' who generally has an office in the nearest town. This legal manager keeps the books of the company, manages the financial affairs and issues reports to the shareholders. He generally acts in the same capacity to a number of mines in the same district and gets a small fee from each. The accounts are kept in the simplest way and no analysis of costs is attempted. The directors—who have nearly always had some practical mining experience—visit the mine periodically and confer with the mine manager on matters relating to the policy of the operations.

By such methods only are these mines made to pay, therefore it must be regarded as a successful method for that class of mine, but the trouble is that with a larger and perhaps better grade mine the method is never altered and to this can be attributed many and costly mistakes. Instances often occur where returns suddenly fall off owing to an incorrect estimate of ore reserves. How these estimates get even as near as they sometimes do is certainly an instance of wonderful guessing, because they are often made without any sampling having been done.

To be a shareholder in such a mine and to feel any security it is necessary to live near the mine so as to be able to visit and if necessary sample it one's self, because it is next to impossible to get any idea of how the mine is developing by reading reports which describe the quality of the ore by such terms as 'good gold,' 'fair gold,' 'mineralized stone,' etc., unless a glossary with equivalents for these terms is also supplied with the report.

But I should like to point out that such methods are only characteristic of certain districts in the eastern states of Australia and that in the other districts, and more particularly in the State of Western Australia, the reports from some of the mines. issued monthly or fortnightly, give so much information that it is possible for a shareholder to keep a plan up to date showing all measurements and values and from it to make a very close estimate of the value of the mine.

As regards the very safe lines laid down by Mr. Curle for the valuing of mines, they are certainly sound enough and must be successful; but if all capital were restricted to such mines as pass his test, the time would presently come when there would be no more mines to invest in, and we would all have to turn 'speculators' again and look for new mines. Would Mr. Curle be able to help us then?

A. J. MACYEAGE.

Kalgoorlie, W. A., March 12, 1904.

PACKING WORKED COAL SEAMS BY FLUSHING.

The utilization of culm and other refuse for packing old workings is now practiced to a considerable extent in the Pennsylvania anthracite mines. Where cities like Scranton are

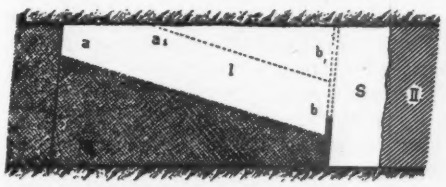


FIG. 1.

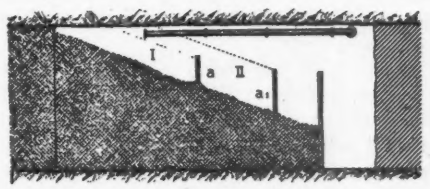


FIG. 2.

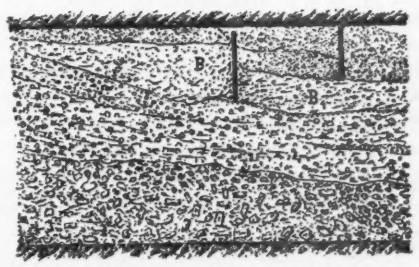


FIG. 3.

built over mined areas it is, of course, necessary that openings shall be filled to ensure firm foundations for the buildings on the surface several hundred feet above. Even where surface conditions do not require it, there are certain advantages in filling. In our bituminous fields, however, such filling is little known, owing partly to the cost of a method which would ensure a higher percentage of extraction, and partly to the fact that usually but one seam is worked; and as the surface is free from large buildings, pillars can be removed by robbing without damage to the mine or to surface structures.

At coal mines in Germany and Austria, filling by flushing is being used more and more. At the Dreifaltigkeit mine in Polnisch-Ostrau, Austrian Silesia, according to a report published in the *Oesterreichische Zeitscrift für Berg-und Hüttenwesen,* where operations had been conducted very unsystematically, it was determined to try to recover many safety pillars left to prevent subsidence, there being a church and other buildings on the surface. The annual output of the mine was 3,000,000 tons from 10 seams. As there is an insufficient supply of sand and gravel, the packing material is a mixture averaging 35 per cent of loam, 25 per cent of mining waste (under 3 in.), 30 per cent sand, boiler ash and coke-dust, and 30 per cent of washing waste. This mixture fills up the space previously occupied by the coal seam, and sets firm enough to stand when the adjoining wall of coal has been taken down. Loam alone dries very slowly but acts better with coke-dust, and the tendency of the lighter particles of dust to float away with the water, and thus foul the pumps, may be checked by a brushwood filter, which is easily washed clean for use over again.

Most of the seams are flat, and therefore more difficult to pack by this method. Moreover, it was found that the heavier ingredients of the packing material had a tendency to settle down at the point nearest the end of the delivery pipe (as at *a*, Fig. 1), the lighter portions being carried on further forward (*b*), and the whole forming an inclined plane (*a, b*). When a certain height has been reached, the end partition (*S*) is raised, and the work goes on until only a small cavity is left near the roof, this being filled up during the packing of the adjoining pillar. This can, however, be dispensed with, if a few intermediate partitions be erected in the partly packed space. Thus, in Fig. 2, a partition (*a*) is set up, and the mouth of the delivery pipe is placed immediately behind it. The high working pressure forces the packing horizontally for about 25 ft. and causes it to pile up close to the roof. When the first compartment, *I*, has been filled up in this manner, the partition is withdrawn to the position (*a*), the flushing pipe is shortened, and the operation repeated, the roof being thus left unsupported for a very short time. The appearance of the solid mass of packing on the removal of the coal in the adjoining pillar is shown in Fig. 3.

Occasionally, when the supply of water runs short, there is some risk of the flushing pipe getting choked up at the bend leading to the horizontal portion. As the removal of the obstruction is a difficult task when the total length of pipe is full of water, taps are screwed into the pipe above the bend, to enable the water to be drawn off before clearing the pipe. To ensure regularity in the water supply, a float is placed in the tank with an indicator outside showing whether it is at any time desirable to stop tipping the packing material into the hopper. Provision is also made for admitting steam into the tank in cold weather, to prevent the water freezing. The 3⅛-in. steel pipe is made in short lengths at the bends, to facilitate replacing in the case of injury.

The system has been in use some months without any appearance of surface subsidence or other damage; and the colliery is now in a position to re-cover all the other safety pillars, and thus utilize much coal hitherto regarded as unworkable.

At the Alma colliery, Gelsenkirchen, Westphalia, as described in the *Colliery Guardian,* a valuable upper seam of gas coal opened 10 years ago could not be worked on account of the danger of surface subsidence damaging a blast-furnace plant and other industrial establishments and many houses. In the experimental flushing outfit now in use, washery waste is led from a hopper on the 301-m. level, to which the waste is lowered from surface

through a 5-in. steel pipe to the 429-m. level. The seam worked there is about 8 ft. thick and has a dip of 70°.

The coal is taken out in pillars 35 ft. wide and 56 ft. long. A row of props is set up next the pillar being worked, and to these coarse bagging is nailed to keep any of the packing from rolling into the working place. The water drains away and runs down the bottom road to the shaft sump, and the packing gets dry and firm almost immediately. The water required is collected on the 301-m. level in a storage reservoir close to the hopper. The cost of flushing is estimated at a little over 6c. per ton, while about 27 per cent more packing can be got into the same space than by hand-work, at practically the same cost.

THE SURVEY OF THE LAKE SUPERIOR REGION.

The United States Geological Survey has now practically completed its work on the ore deposits contained in the pre-Cambrian formations of the Lake Superior region. The monograph on the Menominee iron range has just been issued, and all that remains to be published is a volume on the Lake Superior region as a whole, correlating the conclusions reached in district monographs.

The difficulties encountered by the field geologist in regions where rocks are faulted, sharply folded and profoundly metamorphosed are many. In the Lake Superior country there is the additional difficulty of finding outcrops where a mantle of glacial detritus covers large areas, and where forests or a thick second growth of saplings and bushes limits the view. To offset these difficulties somewhat, the geologists of the Survey have had along certain belts the evidence afforded by many great mines and by innumerable test-pits and boreholes, but this aid, great as it is, is lessened by the alteration of the rocks, which often makes it impossible to determine, by microscopic investigation and chemical analysis, whether or not a given specimen was originally a sedimentary or an igneous rock. In such cases only structural relations can decide and then relations are obscured by folding and faulting. In areas not containing, nor thought to contain, deposits of iron or copper, the geologist must often rely on the evidence of scattered outcrops and an occasional railroad cut. Such mistakes as the Survey has made are due largely to the inability of some geologist in charge of a field party to discriminate. For instance, one man places too much reliance on microscopic work, or he misses the significance of abnormal rock relations. This failure of a subordinate naturally tends to impair the value of the conclusions of the geologist in charge, but in general the supervisory work of the Survey has been excellent.

The Survey began its series of reports on the iron ranges with that on the Gogebic published in 1892, though the field work began in the late 80's. The work was undertaken by R. D. Irving, whose untimely death in 1888 was a great loss to science, and after his death was in charge of C. R. Van Hise, who has been the director of all field work since. The monographs at first were published long after the completion of the field work, but lately with a little more promptness. The monograph on the Marquette range by Van Hise and C. R. Bayley appeared in 1895; that on the Crystal Falls district by Van Hise, Bayley and H. L. Smyth in 1899; that on the Mesabi by C. K. Leith in 1903; that on the Vermilion by J. Morgan Clements last winter; while that on the Menominee, by W. S. Bayley, as previously noted, has just come from the press. A monograph on the copper-bearing rocks, by R. D. Irving, appeared in 1883.

It is stated that the total expenditure made by the Survey for this series of reports has been over $150,000. Large as this sum may seem, it is nothing compared with what has been spent in exploration by corporations and individuals. The work of the Survey in one or two districts has hardly come up to the high standard set in its monograph on the Gogebic, but there can be no question of its great value. Mining companies now recognize the importance of knowing all that can be determined from a study of rock exposures before undertaking expensive underground work. A good geological map can easily save the useless expenditure of many thousands of dollars, by showing where exploration may prove remunerative and where it will prove valueless. It is well to note again in this connection, that though it was about 1886 or 1887 that Professor Irving outlined the ore-bearing formation on the Gogebic, all the work done since then has not shown any more outside the narrow limits he set down. If, on other ranges, subsequent exploration has enlarged here and there the boundaries of the iron-formation, as mapped by the Survey, yet the Survey's maps have saved the waste of large sums of money by localizing work on promising areas.

Aside from the purely economic value of this great piece of areal mapping, the work has enriched the literature of ore deposits, has greatly extended our knowledge of vast time-periods, and finally has disseminated much accurate information about the ore-fields which gave the United States its present supremacy in the manufacture of iron and steel.

COAL PRODUCTION OF NEW SOUTH WALES.—The total output of coal in 1903 was 6,354,846 tons, as compared with 5,942,011 tons in 1902, a net increase of 412,835 tons.

ROPE HAULAGE ROLLERS.—The spacing of rollers on a rope haulage deserves more care than it often receives. About 15 ft. is a good average distance, but the spacing should be irregular to avoid whipping of the rope.

In all rope haulage the condition of the rollers is a matter of prime importance; the rollers should revolve with the utmost ease to avoid loss of power.

ELECTRICAL TRANSPORT OF DISSOLVED SALTS.—At a recent meeting of the French Academy of Sciences, a note by M. A. Ponsot was presented, which suggests a law for the electrical transport of dissolved salts. In the electrolysis of a mixture of salts of the same acid—only one being electrolyzed—the total number of molecules transported depends only upon the nature and the concentration of that salt; it is independent of the presence and the concentration of salts not electrolyzed. If two salts are electrolyzed, the total number of molecules transported depends upon the nature of these salts, on their concentration, and on the electro-chemical equivalent of each. It is independent of the salts that are not electrolyzed, and of the acid.

IRON AND STEEL IN GREAT BRITAIN

The report of the British Iron Trade Association for the year 1903, just issued, gives the production of pig iron in the United Kingdom as follows, in long tons:

	1902. Tons.	Per ct.	1903. Tons.	Per ct.
Forge and foundry	3,860,494	45.0	3,875,826	44.0
Bessemer pig	3,648,948	42.5	3,760,422	42.7
Basic pig	892,218	10.4	991,610	11.3
Spiegeleisen	185,033	2.1	183,346	2.0
Totals	8,586,693	100.0	8,811,204	100.0

The total production for 1903 is not far from the estimates heretofore published; it is slightly greater than any of them.

Changes in production during the year were as follows, with the changes in proportion:

		Tons.	Per ct.
Forge and foundry	I.	15,332	D. 1.0
Bessemer	I.	111,474	I. 0.2
Basic	I.	99,392	I. 0.9
Spiegeleisen	D.	1,687	D. 0.1
Total	I.	224,511	.....

The increase was chiefly in pig iron intended for conversion into steel; forge and foundry iron production being almost stationary.

The approximate consumption of pig iron in 1903 may be calculated as follows:

Stocks, January 1	234,614
Production	8,811,204
Imports	130,280
Total supply	9,176,098
Exports	1,065,473
Approximate consumption	7,869,314
Total	8,934,787
Stocks, December 31	241,311

The consumption includes, of course, pig iron converted into wrought iron, steel and other finished forms. The stocks reported are those in public stores.

The production of steel in the United Kingdom was as follows, in long tons:

	1902. Tons.	Per ct.	1903. Tons.	Per ct.
Bessemer	1,825,779	37.2	1,910,018	38.0
Open-hearth	3,083,288	62.8	3,124,083	62.0
Total	4,909,067	100.0	5,034,101	100.0

The increase in bessemer, or converter, steel was 84,239 tons; while that in open-hearth steel was 40,795 tons, being proportionally less than in bessemer. The total increase last year was 125,034 tons, or 2.5 per cent. only.

The proportions of steel made by the acid and basic processes during 1903 were as follows:

	Acid. Tons.	Per ct.	Basic. Tons.	Per ct.
Converter	1,316,915	26.2	593,103	11.8
Open-hearth	2,613,274	51.9	510,809	10.1
Totals	3,930,189	78.1	1,103,912	21.9

The acid process continues to predominate in British practice, and will continue to do so as long as the present sources of ore supply continue to furnish the raw material.

The proportions of finished steel made by the two processes are as follows, in long tons:

	Bessemer.	Open-hearth.	Total.
Blooms and billets	239,119	400,664	639,783
Rails	1,061,441	84,942	1,146,383
Bars	221,283	537,745	759,028
Merchant steel	125,444	169,394	294,838
Plates and angles	21,840	1,248,079	1,269,919
Totals	1,669,127	2,440,824	4,109,951

Bessemer steel continues to find its most important use in the manufacture of rails; while open-hearth metal is preferred for plates and structural material.

RESISTANCE OF HAULAGE ROPES.—In underground rope haulage on slopes of 4 to 6 per cent, where empty cars pull down the rope, the resistance is 10 per cent of the weight of the rope. Under ordinary underground conditions the minimum grade for empty cars to run down a slope dragging the rope is 2.5 per cent.

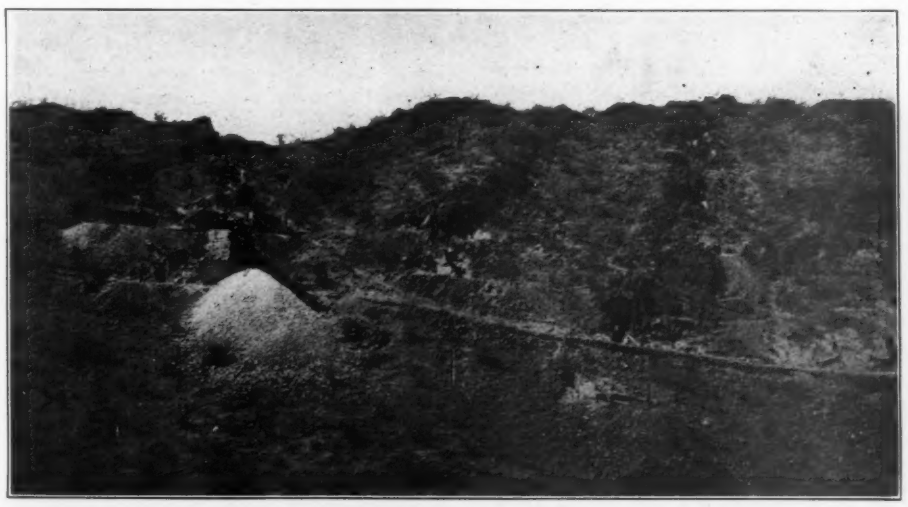
THE SILVERBELL CAMP, ARIZONA.

EDITORIAL CORRESPONDENCE.

The Silverbell camp is situated in the northern part of Pima county, Arizona. The nearest railroad point is Red Rock on the main line of the Southern Pacific; Tucson, the county seat and commercial center of southern Arizona, is 45 miles distant in a southeasterly direction. The camp lies at an elevation of about 2,800 ft., or 1,200 ft. above Red Rock, where all mining supplies are consigned and trans-shipped by wagon to Silverbell.

Mining operations were inaugurated in the district about 40 years ago, since which time it has been the scene of desultory activity as a producer of silver and, in recent years, of copper ores. Thus, while it may lay claim to being one of the older mining camps in this section of Arizona, its progress has not kept pace with recent developments in other districts, despite the fact that good ore-bodies have not been wanting. The lack of railroad facilities and the scarcity of water and fuel have been serious handicaps and have necessarily restricted exploitation to the richest portions of the deposits.

Within the last year, however, the camp has taken on new life through the operations of the Imperial Copper Company. Organized under the auspices of the Development Company of America, the Imperial Copper Company in May, 1903, purchased a large group of claims covering the most promising of the older mines and prospects, and at once formulated a comprehensive plan of development which it has since carried out with well-directed energy. The old workings underground have been extended, several new shafts opened, and new pumping and hoisting machinery installed, besides doing a great amount of necessary surface work. The company has undertaken also the construction of a standard-gauge railroad from Silverbell to Red Rock, a distance of 25 miles, which will place its camp in communication with the principal trunk lines of the Southwest. At present, productive operations are only awaiting the completion of this railroad, which will probably be in operation in the course of a few months. About one-half of the line is now graded.



UNION MINE, SILVERBELL.

The district surrounding Silverbell is a part of a broad area of ancient granitic and sedimentary rocks that extends through southern Arizona to the Gulf of California. Much of the region has been worn down to a smooth plain, leaving only isolated mountain groups that rise but a few thousand feet, at most, above its surface. There is evidence of faulting on a large scale; in fact many of the elevations seem to have been pushed up as great crustal blocks now defined on one or more sides by bold escarpments. The sedimentary strata that once overlaid the granite have suffered almost complete erosion. Occasionally, however, small areas of limestones and sandstones are found as a capping on the highest peaks.

The region has experienced at least two periods of eruptive activity. The latest eruption is represented by a sheet of basaltic lava that extends over the plain and well up the mountain slopes; black buttes of this material also occur here and there over the country. An earlier period of vulcanism has left its vestiges in a few prominences, more conspicuous than the rest by reason of their reddish color, spicular form and unusual altitude. They have the appearance of old volcanic cones that have been trenched and eroded until the cores alone remain, rising precipitously in jagged contours above the plain.

The mines of Silverbell lie within the Silverbell mountains, a small isolated uplift of irregular outline. The elevations on the southwest are composed entirely of granite, but in the central portion this rock carries a capping of limestones and quartzites ranging up to several hundred feet in thickness. The altitude increases toward the northwest where on the very edge of the uplift rises a rugged volcanic peak, which is the most prominent landmark for many miles around. Both the granite and the overlying sediments have been sheared and thrown by faults.

MAMMOTH MINE, SILVERBELL.

The ore-bodies so far developed occur practically within the limits of the limestone area. As indicated by the rusty quartz outcroppings or gossan, the principal zone of mineralization extends along the main axis of the area from southeast to northwest. Eruptive dikes of dioritic character intersect the strata, but they are usually so highly altered as to be distinguished with difficulty from the granite, which is often in faulted contact with the limestone. Outside the limits of this area the granite is frequently copper-stained, and stringers and veins of carbonates and silicates of copper are found. In the vicinity of the diorite dikes the limestone has been marmorized and carries the usual series of contact minerals.

The ores of commercial importance are oxides and carbonates of copper, chalcocite, chalcopyrite and bornite. The oxides and carbonates, chiefly cuprite, malachite and azurite, occur close to the surface and have furnished much of the ore that has been mined in the past. As a rule the oxidized zone does not extend below 150 ft. in depth, and in some of the workings the unaltered sulphides have been found within a few feet of the surface. The change from oxides to sulphides is generally sharp, without any intervening bodies of chalcocite that are such a characteristic feature of Bisbee and other camps of Arizona. Chalcopyrite is the most important sulphide ore and will be the mainstay of future operations, although there is still a large supply of surface ores carrying sufficient values to warrant their exploitation under favorable conditions. They contain a large percentage of silica and lime and would make an excellent flux for the more basic pyritic material.

The larger ore-bodies, so far as they have been exposed by development, appear to be replacement deposits in the limestone and underlying granite. This is the character of the deposits in the Old Boot mine, which has

yielded most of the ore mined in the past, and which is now undergoing the most extensive development. They take the form of lenses and shoots which are usually approximately vertical, and, as might be expected, run in a direction parallel to the principal line of faulting and fissuring. The intrusion of the diorite dikes probably stands in genetic relation to the ore-bodies, while the fractured zones have furnished the channels along which the ore-bearing solutions have circulated. In the vicinity of the deposits the limestones have been silicified and charged with iron, manganese and other minerals. The granite has also been mineralized for some distance from the shoots, by being impregnated with sulphides of copper and iron.

At the Old Boot mine, now called the Mammoth, the ore occurring from the surface down to about 150 ft. has already been taken out. Some of this was smelted at Silverbell, where two 50-ton furnaces were operated for a time by the previous owners. The ore was raised through an inclined shaft that had been carried down to a vertical depth of 400 ft., with the deepest level at 338 ft. A large amount of ore had been developed when the present company took hold of the property, and the supplies have been increased in the past year. To facilitate operations underground a two-compartment vertical shaft has been driven near the old incline, which hereafter will be used only for pumping purposes; the new shaft is now bottomed at 400 ft., where a level is being opened that will tap the ore-shoots at a greater depth than has hitherto been attained.

North from the Mammoth, the mineralized zone has been shown to cross the Page, Comet, Union, Southern Beauty and Imperial claims owned by the company. On the Union a double compartment shaft has been sunk along the contact of a dike to a depth of 250 ft., passing into the unaltered sulphides at about the same level as in the Mammoth. In opening some of the ground advantage has been taken of a system of tunnels that were planned to afford means of transport between the Mammoth mine and the terminus of the railroad to Red Rock on the Imperial claim.

So far the company has not considered the exploitation of the silver-lead ores that are found in the Mammoth and other mines. These ores were the first to be worked in the camp, and it is said that the old Silverbell company took out several hundred thousand dollars of silver from the Imperial mine. Much of this material is an intimate mixture of lead, zinc and copper sulphides, making it a difficult proposition to handle successfully.

The better quality of sulphide ore is to be shipped to the new Douglas smelter for treatment. No provision has been made as yet for dealing with the low-grade material, but should further developments warrant the outlay the company will erect a concentrating plant for this purpose.

PETROLEUM PRODUCTION IN RUSSIA.—According to a recent report from the French Embassy in Russia, the production of petroleum from the Apsheron peninsula last year was 595,000,000 poods, or 9,746,100 metric tons, a decrease of 42,000,000 poods, as compared with 1902. This is partly due to suspension of work on account of low prices; partly to the fact that the new wells in the Bibi-Eibat district have not made up for the exhaustion of older wells.

MECHANICAL CONVEYORS.

By Walter Renton Ingalls.

Mechanical conveyors, of which there is a great variety, may be classified as of (1) the push or drag type, and (2) the carrying type. In the former, the material is pushed or dragged forward in a trough. In the latter type, it is continuously carried forward on a belt, or in a series of connected pans or buckets, which take the place of a belt. In a horizontal conveyor the only mechanical work to be done consists in the overcoming of friction. It is obvious, therefore, that a well-mounted belt or series of buckets can be moved with less friction and therefore requires less power than any form of conveyor in which the material has to be pushed or dragged forward.

All of these conveyors are used in practice, some of them extensively. Some of them are extremely efficient machines; others have very little to commend, yet are useful for some special purposes because of limitations in the application of better types. The special form of conveyor must always be chosen with view to the work that is to be done. In this article, the writer has reference only to the use of conveyors for the transportation of ore and other mineral substances. There is a dearth of practical information on this subject; even the manufacturers appear to lack a good deal of important data, and it will be useful if readers are led to contribute results of their own experience. It is obviously a subject in which experiences may differ widely under varying conditions.

PUSH OR DRAG CONVEYORS.

Among the conveyors of this type are the screw, the scraper, and the reciprocating. All of them have the advantage that material can be discharged, without complicated machinery, at any desired point, which makes them especially useful for the filling of a series of bins.

Screw-Conveyor.—The screw-conveyor is one of the oldest of conveying devices. Also it is perhaps one of the most inferior. The screw-conveyor consists commonly of a trough of iron or steel, with semi-cylindrical bottom, in which is turned an endless screw, composed of a shaft, solid or hollow, and a spiral of steel or cast iron. The shaft is supported in boxes at each end of the trough, and by intermediate hangers in long conveyors, and is driven by pulley, gear or sprocket wheel. The shaft is generally made in sections, which may be united in any suitable manner, though certain devices are much better than others. The spiral is ordinarily of 8 in., 10 in. or 12-in. diameter. In transporting ore it is inadvisable to turn a 9 in. or 10-in. screw at more than 50 to 75 rev. per min., since a higher speed is apt to throw material out of the trough and produce too much dust. Obviously, the speed should diminish as the diameter of the screw increases.

The capacity of a screw-conveyor depends upon the diameter and pitch of the screw, its speed of revolution, and the specific gravity of the material to be transported. One manufacturer gives the capacity of a 6-in. screw, run at 100 rev. per min., at 3 tons per hour; of a 9-in. screw at 70 rev. per min., 8 tons per hour; and of a 12-in. screw at 50 rev., 15 tons per hour. It is presumable that these figures for capacity refer to quartzose ore, which may be taken as weighing 100 lb. per cu. ft. Another manufacturer estimates the capacity of a 5⅞-in. screw at 120 rev., 42 cu. ft. per hour; 7⅞-in. at 110 rev., 71 cu. ft.; 9⅞-in., at 100 rev., 141 cu. ft.; 11¾-in., at 80 revolutions, 247 cu. ft. It is quite right to state these data in cubic feet, instead of by weight, but the speeds given are too high for good practice. However, the capacities appear to be stated moderately, notwithstanding. On the basis of material weighing 100 lb. per cu. ft., the capacity of the 5⅞-in screw would be 2.1 tons per hour; of the 7⅞-in. screw, 3.55 tons; of the 9⅞-in. screw, 7.05 tons; and of the 11¾-in. screw, 12.35 tons. The figures of either of these manufacturers seem to be on the safe side as to capacity, since a 9-in. conveyor run at 70 rev. per min. will certainly transport 10 tons per hour of ore weighing 150 lb. per cu. ft., or 6 2-3 tons of ore weighing 100 lb. per cu. ft.

Ideas as to the power required to operate a screw-conveyor are less definite. In the transportation of any substance horizontally, friction is the only element which has to be overcome, not only the friction of the material itself, but also that of the mechanism. It is evident, therefore, that the power required is a function of the weight of the material, the distance to which to be carried and the speed, plus the similar factors for the mechanism. One manufacturer states that a 5⅞-in. screw run at 120 rev. per min. requires 0.5 h. p. per 33 ft. of length; a 7⅞-in. screw at 110 rev., 6.75 h. p.; and a 9⅞-in. screw at 100 rev.. 1 h. p. These figures are rather lower than practice indicates, and would appear to correspond more closely to the power required to drive the conveyor empty than full. Another manufacturer gives the formula, $H.P. = WL \div 3 \times 33000$, in which W is the weight in pounds of the material to be carried per minute and L the distance in feet to which it is to be carried. According to this, the power required to carry 10 tons of ore 100 ft. per hour would be only 0.33 h. p., which of course is absurd, since it would require far more power than that to run the conveyor empty. A 9-in. screw conveying that quantity of material would probably require 4 to 5 h. p. The formula should evidently be expressed as $H.P. = [WL \div (3 \times 33000)] + FL$, in which F stands for the power required to turn the screw itself at a specified speed. The screw is wasteful of power, because not only is the ore pushed through the trough as in the scraper conveyor, but also the screw presents a greatly increased frictional surface, while it is subject to all the frictional resistance of a poorly supported and carelessly attended line of shafting, running in grit all the time.

The screw-conveyor is the cheapest of all conveyors to install. A 9-in. screw, 100 ft. long, ought to be put up for about $300. On the other hand, all of its parts are subject to heavy wear, and repairs and renewals may easily amount to 100 per cent per annum, this depending upon the work required of it. There are some cases wherein it is advantageous to use a screw, notwithstanding its serious drawbacks. They are at their best when used for finely-crushed and dry ore. They are more troublesome with wet, clayey ores, and are quite unsuitable for coarse ores. A very long screw is apt to be a nuisance anyway. A short screw often makes a good feeding device. The screw-conveyor with externally heated trough has been proposed as a drying and roasting furnace. It has been used occasionally for the former purpose, but not for the latter. Neither arrangement commends itself.

Rotary Conveyor.—The screw-conveyor is often referred to as a spiral conveyor. Another form of spiral conveyor consists of a cylinder with an interior spiral, the cylinder being supported on rollers and revolving like a cylindrical roasting furnace. Conveyors of this form are seldom used. They would appear to be costly, clumsy and difficult to repair, while material can only be fed at one end and discharged at the other end, which in adaptability would make it the least advantageous of all conveyors. If the cylinder be set on an incline, or if it have a taper, of course no interior spiral is necessary. The cylindrical dryer and several forms of roasting furnaces are really forms of this type of conveyor, just as other mechanical drying and roasting furnaces embody the principle of the scraper conveyor. Roasting cylinders as long as 60 ft. are used in Europe, and cement kilns as long as 120 ft. are used in the United States.

Scraper-Conveyor. — The scraper-conveyor consists essentially of a trough in which the ore is dragged forward by a series of transverse push-plates, called flights. The method of connecting the push-plates is subject to a large number of modifications. Thus there is the continuous cable, dragging circular flights through a V-shape or semi-cylindrical trough, and the monobar conveyor, in which the flights are carried by a series of single linked bars. One of the commonest forms of this type of conveyor is, however, the double link-belt chain, supported on rollers, wheels or sliding shoes, which run on rails at each side of the trough, carrying the flights between them. This is known as the suspended-flight conveyor. The chains pass over sprockets at each end of the conveyor and return on overhead rails. The sprockets at one end are keyed on the driving shaft, while those at the other end are carried in boxes which can be adjusted to take up the slack in the chains. The monobar conveyor can be constructed so as to make a bend in the horizontal plane, or even make the complete return circuit.

The scraper-conveyors have the advantage that they can be arranged to be fed or to discharge at any point. They have the disadvantages of involving a good many wearing parts and requiring considerable power to drive. The Link-Belt Engineering Company gives the following formula for power:

$$H.\ P. = (ATL + BWS) \div 1000,$$

in which A and B are constants depending on angle of inclination from the horizontal, T is the tons per hour to be conveyed, L the length of the conveyor in feet, center to center, W the weight in pounds of chains, flights, and shoes, and S the speed in feet per minute. For horizontal runs, $A = 0.343$ and $B = 0.01$. According to this formula, the power required to move 10 tons of ore per hour the distance of 100 ft. would be 3.5 h. p., but we should hesitate to reckon so low. Anyway, it always requires more power to start a conveyor than to operate it and therefore a larger motor should be provided. Scraper-conveyors are usually operated at speeds of about 100 ft. per minute. The weight of the chains, scrapers, wheels and axles, or rollers, amounts to about 30 to 35 lb. per foot, center to center, for a 10-in. or 12-in. suspended flight conveyor, which at 100 ft. travel per minute will have capacity for moving about 10 tons per hour of ore weighing 150 lb. per cu. ft. The cost of a suspended flight conveyor 100 ft. long, installed, will come to about $450.

The capacity of a scraper-conveyor depends upon the width of the trough, the speed of the chain, the volume of the ore, and the frequency of the flights. The flights are commonly set 16 in., 18 in. or 24 in. apart. Obviously, the flights will not push the ore ahead in an even sheet, but will crowd it up into little heaps, a succession of which will be moving through the trough. Therefore, the more frequent are the flights, the greater the capacity of the conveyor. The suspended-flight conveyor is superior to other forms; it requires about 20 per cent less power than the simple drag, runs more smoothly and is not so noisy. The point of special weakness in these conveyors is the chains, the breakage of which is likely to cause costly and vexatious delays. The monobar is better than the chains; the latter, if used, should be provided of greater strength than is frequently the case. The scraper-conveyor gives the best results with fine ore and moderate lengths. Many examples of large and long installations for the handling of lump ore, coal and rock are to be seen. They are very noisy and are subject to frequent breakdowns.

Reciprocating Conveyor.—The reciprocating conveyor is a new modification of the scraper conveyor, which is finding considerable favor. In this the ore is pushed forward in a trough by a series of flights which are hinged at regular intervals to a ladder-like frame, composed of a pair of channel beams joined by suitable cross-bars and mounted on rollers. This frame is given a reciprocating motion by a crank mechanism, which can be placed at any convenient point. In another form, the flights are fixed to a reciprocating rod, as an iron pipe of suitable strength, which is supported by wheels and axles. In either case, the flights are so hinged that in their forward motion they bear against stops, and push the material along, while in the backward motion they return to the starting point by dragging back over the top of the material. In this way the ore is literally shoveled forward stroke by stroke.

The reciprocating conveyor has these advantages: It can be fed and discharged at any point; it occupies less height than the chain scraper-conveyor; and all of its wearing parts, which anyway are comparatively few, are outside of the grit, save the flights themselves and the trough. On the other hand, it is uneconomical of power, owing to the frequency with which motion is reversed. At every stroke the inertia of the entire lot of ore in the trough has to be overcome and this will probably limit the usefulness of this type of conveyor to a comparatively moderate length. Moreover, they are obviously inapplicable to conveying materials containing lumps. They are considerably more costly than the ordinary scraper-conveyor, the cost varying according to the details of manufacture. Thus, to install a reciprocating conveyor 100 ft. long, capable of transporting 10 tons per hour of ore weighing 150 lb. per cu. ft. would cost from $700 to $1200 (actual quotations, with an allowance for cost of installation). A 15-h. p. motor should be provided to drive. The capacity of this form of conveyor is determined by substantially the same factors as in the case of the scraper-conveyor.

Another form of reciprocating conveyor consists of a light trough, supported or suspended in a suitable manner, to which a to-and-fro movement is imparted by suitable mechanism. This form of conveyor is not in general use, but the writer has seen it employed with good success for transports of several hundred feet, the entire installation being of the simplest construction. Obviously, however, it is suitable only for fine, dry material, or else a loose pulp. In either case, the forward travel of the material will depend upon the slope of the trough and the length and number of the jerks. The Wilfley conveyor, which is of this type, is used for the transport of wet concentrates, the motion of the trough being given by the same mechanism that is used for the Wilfley table. A recently patented reciprocating trough-conveyor has the bottom of the trough made in a serrated form, so that at each jerk the material goes over a ledge and therefore attains a positive forward movement.

(To be continued)

MINING ENGINEERS AT THE ST. LOUIS EXPOSITION.

The members of the American Institute of Mining Engineers, resident in St. Louis and in the adjoining districts in Missouri and Illinois, met April 9 at the rooms of the Chief of the Department of Mines and Metallurgy, in St. Louis, to prepare for entertaining mining engineers and metallurgists during the World's Fair. The meeting organized by electing Mr. Arthur Thacher, president of the Central Lead Company, chairman; Mr. F. E. Drake, manager of the Lanyon Zinc Company, treasurer; and Professor H. A. Wheeler, superintendent of the Mining Reservation at the World's Fair, secretary.

It is the intention to appoint about 12 vice-chairmen, each of whom will be prominently identified with the different mining, metallurgical or technical industries of St. Louis and vicinity. Their names will be announced later. An executive committee was appointed, as also committees on railroads, finance, and the press.

The headquarters of the local committee will be in the Mining and Metallurgy Building at the World's Fair, where an attractive space has been allotted for the Institute of Mining Engineers.

The very inclement weather greatly interfered with the attendance at the meeting, and local members or affiliated interests, who desire to co-operate or wish further information, are invited to correspond with the secretary, H. A. Wheeler, Mines Building, World's Fair.

PEAT FUEL IN SWEDEN.—In Sweden, according to recent reports, peat fuel is used in locomotives. On the Government railroad from Elmhut to Malmö specially constructed freight locomotives have been fired during the past year wholly with peat fuel, or with a mixture of the peat blocks with English coal, and the engineer's reports claim for the experiment both a mechanical and economic success.

POWER TRANSMISSION CHAINS.—Charles H. Hills, in a paper read before the Indiana Engineering Society, January 14, 1904, described various forms of machine-made chains with blocks and rollers for power transmission. Such chains should be properly cared for and kept clean. For lubrication a mixture of oil and graphite is preferable to dry graphite. The sprocket wheels are frequently the weak point in a chain transmission, the tendency being to use small sprockets, which are easier to make, and cheaper in first cost. No sprocket having less than 12 teeth should be used.

THE GUANAJUATO MINING DISTRICT.

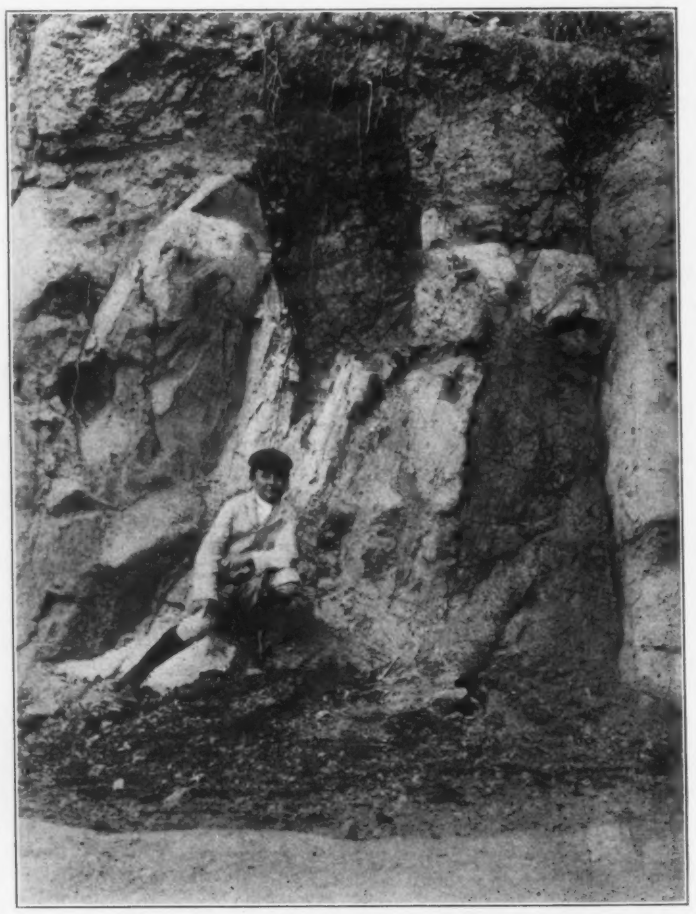
By Robert T. Hill.

(*Continued from page 601.*)

The ores of Guanajuato contain gold and silver in association with sulphides of the baser metals. The surficial oxides have been almost entirely removed. The proportion of gold and silver values varies; a ratio of 40 to 60 may be taken as the average for the district. The ore is generally in the form of black sulphide streaks in the quartz, although also finely disseminated through it. It also envelops pieces of the breccia. Nearly all of the big quartz veins are mineralized, but the higher grade ore is concentrated in shoots or bonanzas, which seem to occur at the intersection of the complemental cross-veins. These ore-bodies have been of great size and value, as testified by the vast chambers in the mines. Pyritic ores also occur in many places. The quartz as a rule is hard and requires fine grinding when milled. In some instances, I have seen traces of more than one epoch of mineralization and fissuring, the primary veins being shattered, faulted and then crossed by secondary veinlets. This condition conforms with what might be expected from the geological history, which shows that the area has been a locus beneath which the series of magmas have successively intruded.

While the bulk of the Guanajuato ore comes from streaks of amorphous black sulphides, the mines are noted for the many rare and beautiful forms of silver, such as proustite, argentite, aguilarite and stephanite. The crystals of calcite and apophyllite are also remarkable. Cinnabar has been reported, copper occurs in one of the mines only, and tin is found in nodules and veinlets in the rhyolite cap-rock of the southern part of the district. The Carmen mine presents an exceptional occurrence; here the ore consists of replacement matter in the form of a clay lining cracks in the rhyolite and andesite.

ORE-BODY OF 7TH LEVEL, REFUGIO MINE.



BILLY'S FAULT—SHOWING TYPE OF STRUCTURES.

Both the Veta Madre and La Luz belts are marked by large dumps. Upon the Valenciana property there are six dumps, the cubic contents of which I estimate at about 1,500,000 tons. The Rayas-Mellado has several ore dumps containing probably 1,000,000 tons. It is estimated that the five dumps of the Rul group in La Luz belt contain over 1,000,000 tons, to wit: those of the San Pedro, Rosario, Purisima, and San Ignacio. One of the Veta Madre dumps samples $3.80[1] per ton. It is estimated that the dumps adjacent to the mother vein, along a line of workings two miles in length, between San Miguel and Guadeloupe, contain 5,000,000 tons. The dumps of the Jesus Maria mine, a type of La Luz district, run over $4.30 and carry over 50 per cent of their values in gold. I have seen a report and sampling plan of the Jesus Maria dump which averaged over $4.50 and in which the gold values were 53 per cent of the whole.

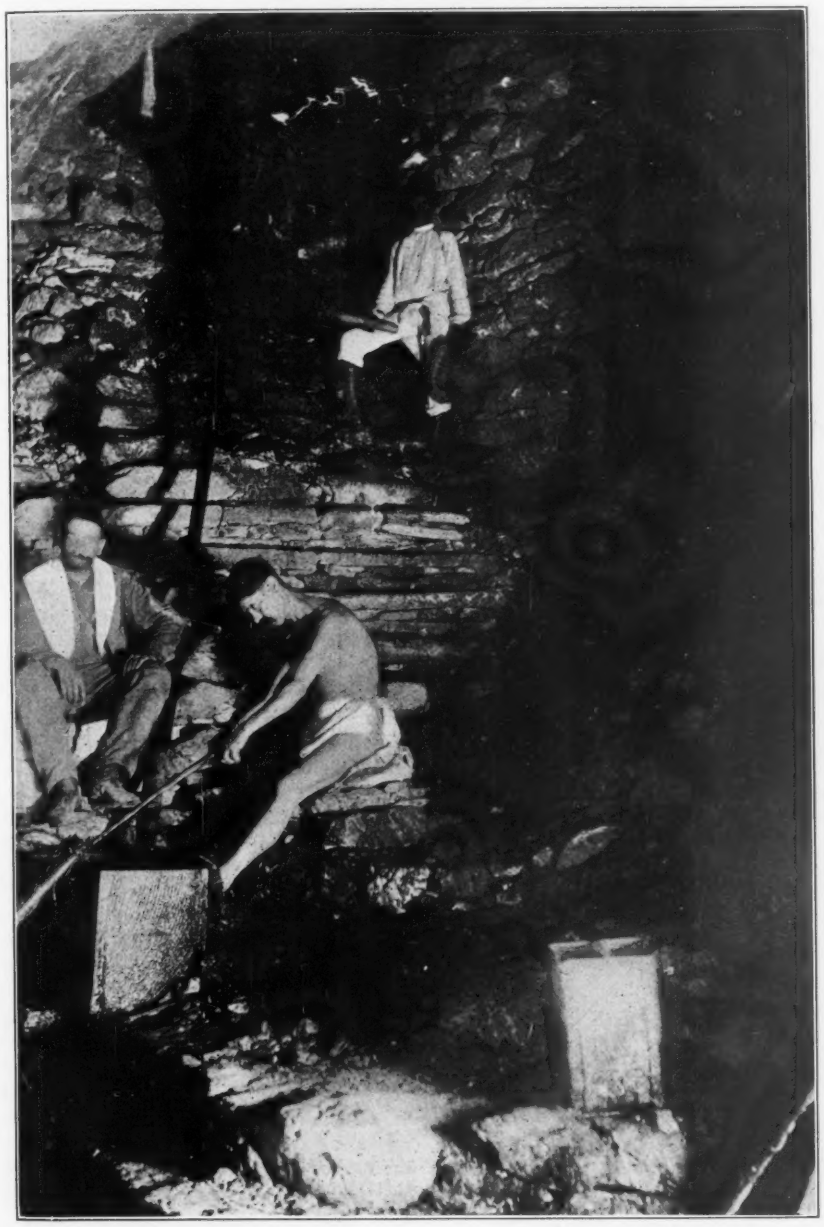
In the standing ore, in the waste remaining in the mines and upon the ore dumps of the Veta Madre and La Luz properties, there are undoubtedly large quantities of low-grade stuff. From numerous samplings of the entire district, I am led to believe that the following deductions, made by an able mining engineer, are well within the possible minimum valuations of the Rul properties and the camp in general.

Average sample values of the dumps	$3.80
" " of waste in mines	7.00
" " of unstoped ore in mines	6.00
General average of all material	6.32

Another resource of the Guanajuato district which may be considered worthy of consideration as an ore reserve, is the vast quantity of tailings from the forty or more old *patio haciendas* and the wash from the ore dumps which now fill the valley of the river for several miles. At the beginning of the seventeenth century there were 37 of the old patio plants at work along the banks of this river. Students of the problem have estimated that gold to the value of $120,000,000 and silver to

[1]All values are given in United States currency, unless otherwise stated.

the value of $60,000,000 and quicksilver to the value of $18,000,000, besides 240,000,000 lb. of copper sulphate have been lost in the patio treatment and deposited along the river bed. The Guanajuato River Mining Company has been organized for the purpose of reclaiming and treating these river deposits. It is not claimed that the $200,000,000 alleged to have been discharged into the river through the imperfections of the patio process may be fully recovered, but the projectors of the enterprise have reasons to expect, by the aid of scientific methods and modern engineering, to recover a considerable portion of the metals.



INTERIOR OF VALENCIANA, SHOWING ANCIENT STAIRWAYS.

The production of the Guanajuato district to-day is relatively small, being limited by lack of milling facilities. Except the 60-stamp mill of the Guanajuato Mining & Milling Company, which gives pan-amalgamation treatment to the produce of La Sirena mine, and the five old Mexican *patio haciendas* still operating, no ores are reduced at Guanajuato. Other mines depend upon the smelters at Aguas Calientes and elsewhere, but the freight and transit charges are so high as to preclude the mining of low-grade ore.

At the present time the total output of the district is about 340 tons of ore per day. Of this amount, 140 tons are produced from La Sirena mine and treated at its mill; 110 tons are treated in the old *haciendas* and 90 tons are purchased by the ore-buyers for shipment to the smelters. Much of the ore shipped from Guanajuato is brought in by *buscones,* who work over the waste in the great stopes of the Valenciana and pick the old dumps. Some of these men are allowed to knock down fragments of ore left standing in the upper workings of the old mines, and others work the outcrop of the Veta Madre.

The water available seems ample for all mining purposes. The district has a heavy precipitation during the rainy season, and there is a large catchment area to supply the various streams. In this connection it is interesting to note the storage dams, in the construction of which the Guanajuato engineers appear to excel. In the arid regions of the United States, much difficulty has attended the erection of such dams and those erected have frequently broken after slight service. The storage dams around Guanajuato seem to withstand the stress of time; one of them, known as the Presa de los Santos, bears the date of 1778.

Many of the old mines are now under water—in fact, all of any depth, except La Sirena, Refugio and Cata, which have been unwatered. In Rayas, Mallado and San Miguel of the Veta Madre and most of the La Luz mines, there are large quantities of dead water. It has been estimated that there are 1,200,000 metric tons of water equivalent to 300,000,000 gal. in the Rul group of the Veta Madre mines, and that the cost of unwatering them would be $40,000. The water in these mines is largely surficial storage and presents no obstacle like that encountered at Tombstone, where there is a constant underground flow. The water has been removed and controlled by Cornish pumps in times past. It is controlled by hoists and buckets at La Cata, which mine is comparatively dry far below the store of accumulated water in the adjacent mines, the water being dammed off from the workings of La Cata. Furthermore, the water does not pass freely from mine to mine. The dry workings of Cata extend several hundred feet deeper than the water in Rayas, the adjacent property. The highest standing water in the latter is kept out of La Cata by a masonry dam in the high level connection between the mines. The deepest working in the district (Valenciana, 2,400 ft.) was operated by an incline without modern pumping appliances at the time of cessation of operations. In Refugio of La Luz district 800 ft. of the mine is dry, all the bottom water standing in a small sump. The San Cayetano adit, over 2.5 miles long, runs less than a gallon per minute.

The present mine-water, rather than being considered a detriment, should be counted an asset by reason of its value for milling operations. In this connection it may be stated that the Valenciana was easily unwatered as late as 1892 for inspection; La Sirena, one of the old flooded mines of the Veta Madre, which is now owned and operated by the Guanajuato Consolidated Mining Company of New York, was drained about four years ago; and the Refugio, one of the deepest of the La Luz mines, was similarly unwatered last year.

Labor, skilled and unskilled, in Guanajuato is abundant and cheap. Furthermore, the people belong to a race which, through generations of work in the mines, has acquired an efficiency and an attachment for the locality which makes them fixed and contented. The price of common labor for 10 to 12 hours' work per day is 50c. Mexican, or about 23c. United States currency. Skilled miners and drillmen are also abundant, and their prices range from 75c. to $1 Mexican per day. Compared to the price paid in American mines—that is, $3 to $4 per day for eight hours' work—it will be seen that the possession of this laboring class is by no means one of the least important features of the district.

Coal in Guanajuato to-day costs more than $20 per ton; corn, the motive power of the ancient *hacienda* processes, is likewise high in price. Horse-power, whether expressed in boiler coal-consumption or burro corn-consumption, costs over $200 per annum. The promoters of modern Guanajuato set about to procure cheap power and the result of their labors is epitomized in the construction of the electric plant near Zamora. At a point 101 miles south of Guanajuato the Rio Tuero brings down from the forest-clad summits of the mountains of Michoacan an abundant supply of water, which hitherto has run unused into Lake Chapala. Near the city of Zamora a site was found where these waters could be harnessed by the construction of a

canal; four 1,000 h.p. generators were installed; 1,300 steel aeromotor towers, each 50 ft. high, were erected, and strung upon these were three copper cables, each composed of 19 hard-driven strands equivalent to No. 1 wire. The current is stepped up from 300 to 60,000 volts. At Guanajuato, there are step-down transformers of 1,970 kw. each. The entire plant is the finest and best that the General Electric Company could furnish. Its capacity is 5,000 h. p., all of which, except 400 h. p. diverted to Irapuato, goes to Guanajuato. From the power-house at Guanajuato, wires lead to many mines which were ready to install electric hoists and drills when President Diaz, on October 18 last, turned on the power. What the Guanajuato Power & Electric Company will charge per horse-power is not my business to relate, but $60 per year will give its projectors a fortune and, as its existence depends upon the building up of Guanajuato, it is but reasonable to presume that the company intends to live and let live.

The cost of mining and treatment at Guanajuato by modern milling and cyanidation can best be judged from the experiences of the Guanajuato Consolidated Mining & Milling Company, the only concern which treats its own ores, from La Sirena, a type of the old mines of the Veta Madre. From careful inquiry it appears that this company now mills and amalgamates its ores for $1.95 to $2.10 per ton. The entire cost of mining and treatment of the ore is $5.48 per ton. Of this amount $2.54 is for mining and transportation to the mill. This plant is paying an exorbitant price for its coal, estimated at $180 per horse-power per annum, and the plant itself, which uses pan-amalgamation instead of cyanidation, is not of the most economical type. With electric power and cyanidation the cost of treatment would be greatly reduced.

Owing to the high cost of smelter treatment due to railway charges and the heavy expense of milling, only ores having a valuation of $20 per ton or over are able to yield a reasonable profit. The great need of the district to-day is milling facilities, and when large custom-mills are built at Guanajuato, the camp will be stimulated to renewed activity and a production worthy of its historic record.

RUSSIAN PETROLEUM EXPORTS.—Exports of crude and refined petroleum from Russia in 1903 are estimated at 80,000,000 poods, or 1,310,400 metric tons, an increase of 8 per cent over 1902. Part of the gain was in exports to Europe, which were 27,000,000 poods, and part in exports to the East, chiefly China.

GERMAN IRON PRODUCTION.—The output of pig iron in Germany for the two months ending February 29 is reported by the German Iron & Steel Union as below, in metric tons:

	1903.	1904.	Changes.
Foundry iron	275,526	295,540	I. 20,014
Forge iron	145,308	134,325	D. 10,983
Steel pig	137,294	90,690	D. 46,604
Bessemer pig.....	51,996	80,490	I. 28,494
Thomas (basic) pig.	926,764	1,010,468	I. 83,704
Totals	1,536,888	1,611,513	I. 74,625

Steel pig includes spiegeleisen, ferro-manganese, ferro-silicon and all similar alloys. The increase this year was chiefly in bessemer and basic iron.

COPPER EXTRACTION AT RIO TINTO*.

By C. H. Jones.

The ore treated at Rio Tinto is a massive iron pyrite containing up to 3 per cent of copper, which has been disseminated through the mass by secondary enrichment. Extraction of the copper is effected simply by allowing huge heaps of the mineral to oxidize under the influence of moisture and air, with subsequent leaching of the copper sulphate by running water.

At the outset it should be clearly understood that the successful application of this method depends largely upon the state in which the copper occurs in the ore. If it exists as chalcopyrite, $CuFeS_2$, the copper will not oxidize by simple exposure to the air; in one case it took many years to oxidize 10 per cent of the copper originally present. If the copper is in the form of CuS (covellite), the oxidation proceeds very slowly. The best form for solution is Cu_2S or copper glance, which constitutes the bulk of the copper in Rio Tinto pyrite. These statements will be made clearer from the following account of the reactions that take place during the oxidation.

When the ore is exposed to free access of air and moisture, some ferrous sulphate is formed in accordance with the reaction:

SURFACE OF HEAPS, ARRANGED FOR WASHING.

(1) $FeS_2 + 7O + H_2O = FeSO_4 + H_2SO_4$.

This ferrous sulphate becomes readily oxidized by the air to ferric sulphate:

(2) $2FeSO_4 + H_2SO_4 + O = Fe_2(SO_4)_3 + H_2O$,

and it is due to the action of this ferric sulphate on the copper sulphides that the copper is rendered soluble, thus:

(3) $Fe_2(SO_4)_3 + Cu_2S = CuSO_4 + 2FeSO_4 + Cu$.

(4) $Fe_2(SO_4)_2 + CuS + 3O + H_2O = CuSO_4 + 2FeSO_4 + H_2SO_4$.

Reaction No. 3 takes place rapidly and causes half the copper to go into solution within a few months, while No. 4 proceeds slowly and requires, under favorable conditions, about two years to extract 80 per cent of the remaining half of the copper.

Here I may add that, under the direction of Mr. W. A. Jenkin, in the laboratory at Rio Tinto, a method has been worked out to determine the state of combination of the copper in any particular mineral. This method depends on the action of the mineral on various solutions under constant conditions of dilution and temperature, and, though necessarily somewhat arbitrary, it shows with considerable accuracy the form of sulphide in which the copper exists, and consequently whether the copper can be readily extracted by wasting in heaps.

In practice the method adopted to bring about the desired oxidation is as follows: A site is chosen for the formation of the heap where the ground is sufficiently concave and sloping to enable the copper liquor that is formed to collect and run out at the base of the heap. On the ground is first arranged a network of air-flues, made of rough stones, and having an internal diameter of 12 in. Vertical chimneys, 50 ft. distant from one another, are built in the same manner and connect with the ground-flues. Care is taken that the mouths of the flues are kept open and not covered by the ore. The ore, the lump portion of which has been passed through jaw-breakers to be reduced to pieces not larger than from 2 to 3 in. across, is now discharged from side-tip wagons over and around the stone flues. Lumps and fines are dumped alternately until the height of the mass at the edge is about 30 ft., the upper surface of the ore being kept level. A heap of this form contains approximately 100,000 tons.

As the ore is added, the building of the stone chimneys keeps pace, so as to maintain a clear opening to the top of the heap. The surface is formed into squares by means of ridges, the size of the squares depending on the porosity of the heap. The function of these ridges is to enable the water to be run locally over the surface of the ore in order to insure that all parts are equally washed, and that the water does not run through the heap in channels. A system of gutters is also arranged so that the water can be distributed to all parts of the mass. As the heap is being formed, water is run on, and the copper sulphate present is extracted; the water also provides the moisture for oxidation in accordance with the equations given above. The heap is then allowed to oxidize, which it does rapidly, as evidenced by the heat produced, the temperature in the chimneys mounting to from 170° to 180° F. As the temperature rises, the surface-openings may be closed in order to allow the oxidation to spread. The surface gradually shows a brown coloration due to the de-hydration of the buff-colored basic ferric salt that forms on the top of the mass, and its gradual heating-up may be noted by this drying action. The greatest care must be taken not to allow the heap to fire, for if once started it is difficult to extinguish. When the oxidation has proceeded as far as is safe, water is run on at the rate of about 50 cu. m. per hour, until the soluble copper is leached out; the heap is then allowed to re-oxidize and the washing is repeated. When a year has elapsed the surface requires 're-tilling' and the squares are re-arranged so that the places where the ridges were before are now the middle of the squares; the gutters also are shifted. At the edge of the heap for a distance of some yards, the ore, which has become cemented, holds copper salts, and is dug down into terraces in order that this copper may be extracted by washing. When the copper is reduced to 0.3 per cent, the heap is considered washed and the material, containing 49.5 per cent of sulphur, is removed and exported as "washed sulphur-ore," to be utilized in the manufacture of sulphuric acid.

Successful heap-washing depends on the efficient ventilation of the mass, the trouble

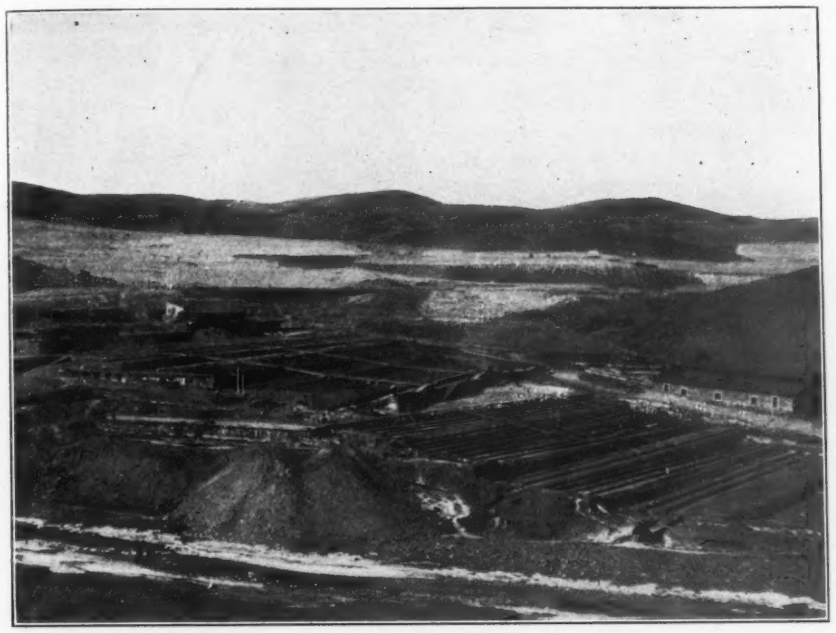
*Abstract from paper entitled 'Wet Methods of Extracting Copper as Adopted at Rio Tinto, Spain.' By Charles H. Jones. Read before the American Institute of Mining Engineers. February, 1904.

usually being a too great excess of fines, which cement hard and clog up the air passages.

The copper liquor as it runs from the heap contains some ferric iron in solution, which is very objectionable; in order to remove it, the liquor is run over a smaller heap of fresh ore known as a 'filter bed' which reduces the ferric iron. This 'bed' is laid inside a reservoir formed by a masonry dam across a small ravine (*barranca*), and the liquor, after percolating through the ore, remains in contact with it until required to be drawn off to the precipitating tanks. When the ore is fresh, the reduction of the ferric iron takes place rapidly, due to the Cu_2S, as shown by the equation (3), but the iron pyrite itself has an effective reducing action on ferric iron in solution, thus:

$$(4)\ 7Fe_2(SO_4)_3 + FeS_2 + 8H_2O = 15FeSO_4 + 8H_2SO_4.$$

The principal constituents of the liquor as it enters the cementation tanks are as follows, the figures given representing the grams per cu. m. or units per million parts: Copper, 4,000; ferric iron, 1,000; ferrous iron, 20,000; free sulphuric acid, 10,000; and arsenic, 300. The large quantities of ferrous iron and free sulphuric acid present are due to the fact that the waste liquor, *salida*, as it is called, from the cementation tanks after the copper has been precipitated, is pumped back and used for washing the heaps in addition to fresh water, and consequently these solutions tend to become concentrated. The liquor is then run from the reservoirs at about 300 cu. m. per hour through the precipitation tanks over pig-iron in order to precipitate the copper in the form of 'cement copper' or 'copper precipitate.' These cementation tanks are arranged in series on the slope of a hill, the liquor passing backward and forward, until it is discharged from the lowest tank of the series free from copper. Each series consists of three tanks in parallel, arranged so that the liquor can be divided and passed down as many times as necessary, depending on the quantity of liquor that is being run through and its varying temperature at different seasons, for the hotter the solution, which in summer reaches 100° F., the faster is the rate of precipitation. Each tank is about 3.2 ft. long, 5.5 ft. wide by 2.25 ft. deep and has a slope varying from 2 per 1,000 in the first series to 11 per 1,000 in the last, the reason for the increase in slope being that as the liquor becomes impoverished in copper, the free acid present is more active in wastefully dissolving the pig-iron—an action which is considerably diminished by increasing the velocity of the liquor by means of the increased slope of the tanks. The tanks themselves are made of 9 by 3-in. boards attached to wooden frames set in cement, the space between parallel tanks being filled in with stone and cement, constituting a wall supporting the sides of the tanks. No metal is used in the construction, hard wooden pegs being employed to attach the boards to the frames. The spaces between the boards are carefully calked with oakum and pitch, in order to render the tank watertight. At each end is an arrangement by which a door can be dropped in and luted so as to cut out any particular tank, and there are also wooden plugs that can be removed so that the liquor from each tank can be run off, and thus allow the removal of the precipitated copper. A few old boards are placed on the bottom of the tanks for their protection, and on these are piled up the pigs of iron, each layer being at right angles to the next, until the tank is filled; each foot-length of the tank contains about one ton of iron. The liquor is allowed to run through the system of tanks and needs no attention, except to remove the precipitated copper and to add fresh iron. The *salida*, containing from 15 to 20 grams of copper per cu. m., is allowed to run to waste, because, at about this copper-content, the amount of iron required to precipitate the copper equals the value of the copper recovered. Daily some of the tanks are cleaned out by being closed as described above, the liquor meanwhile passing down the other tanks of the series; the liquor is run off into settling tanks, and any copper in suspension is there recovered; all of the iron is removed from the tank and piled on to the dividing wall; at the same time the copper adhering to the iron is knocked off and thrown back into the tank. The dirty looking precipitate is then transferred to the classing and concentrating plant, the iron is replaced in the tank, and the liquor again allowed to run through it. This crude precipitate, containing about 70 per cent copper, is thrown, a little at a time, onto a perforated copper plate placed at the head of a long launder, and is washed through by a strong stream of water from a small nozzle. The material that does not pass through this screen consists of leaf-copper and small pieces of iron; this is thrown into a heap and afterwards sorted over by girls who remove the pieces of iron. The precipitate that passes into the launder is turned over against the stream of water, and by this simple means a concentration is effected. The first few yards of the launder contain a red precipitate



GENERAL VIEW OF PRECIPITATING TANKS, COPPER LIQUOR DAM AND MINERAL HEAPS.

REMOVING CEMENT COPPER FROM PRECIPTATING TANKS.

known as No. 1, containing 94 per cent copper, and less than 0.3 per cent arsenic; following this is No. 2, containing 92 per cent copper, and between 0.3 and 0.75 per cent arsenic, while below is the No. 3 precipitate; this is in a state of very fine division and contains on an average 50 per cent copper and 5 per cent arsenic. This last-named portion, which carries all the graphite from the pig, contains the bulk of the antimony and bismuth that is also precipitated from the liquors. No. 1 and 2 are removed to the drying sheds, and are bagged for shipment to the refinery; the No. 3 precipitate is removed, moistened with acid liquors, made into balls by hand and dried in the sun. These balls become cemented hard and can be readily transferred to the smelter, where they form part of the charge for the blast-furnaces, and are run down to matte to be subsequently bessemerized, thus effectively removing the arsenic, antimony and bismuth that they contain.

The reactions that take place in the concentration tanks are as follows: The first reaction that occurs in the liquor running over metallic iron is the reduction of the ferric sulphate to ferrous sulphate, the final result being:

(5) $Fe_2(SO)_3 + Fe = 3FeSO_4$.

This action causes the consumption of the pig-iron without any corresponding yield in copper, and consequently should be avoided as far as possible, by having all the iron in the ferrous state.

The second reaction is the precipitation of the metallic copper, brought about by galvanic action. The iron becomes coated with copper, and thus the iron and copper in the acid liquor constitute a galvanic couple with a considerable difference of potential. It is due to the electrolytic action that the copper and all other metals present that are electro-negative to iron become precipitated. The final result may be expressed thus:

(6) $Fe + CuSO_4 = FeSO_4 + Cu$.

Besides these reactions, there is a liberation of hydrogen, as evidenced by the bubbles of gas that rise in the tank liquor. This action, which causes a wasteful consumption of the iron, may be expressed by the equation:

(7) $Fe + H_2SO_4 = FeSO_4 + H_2$.

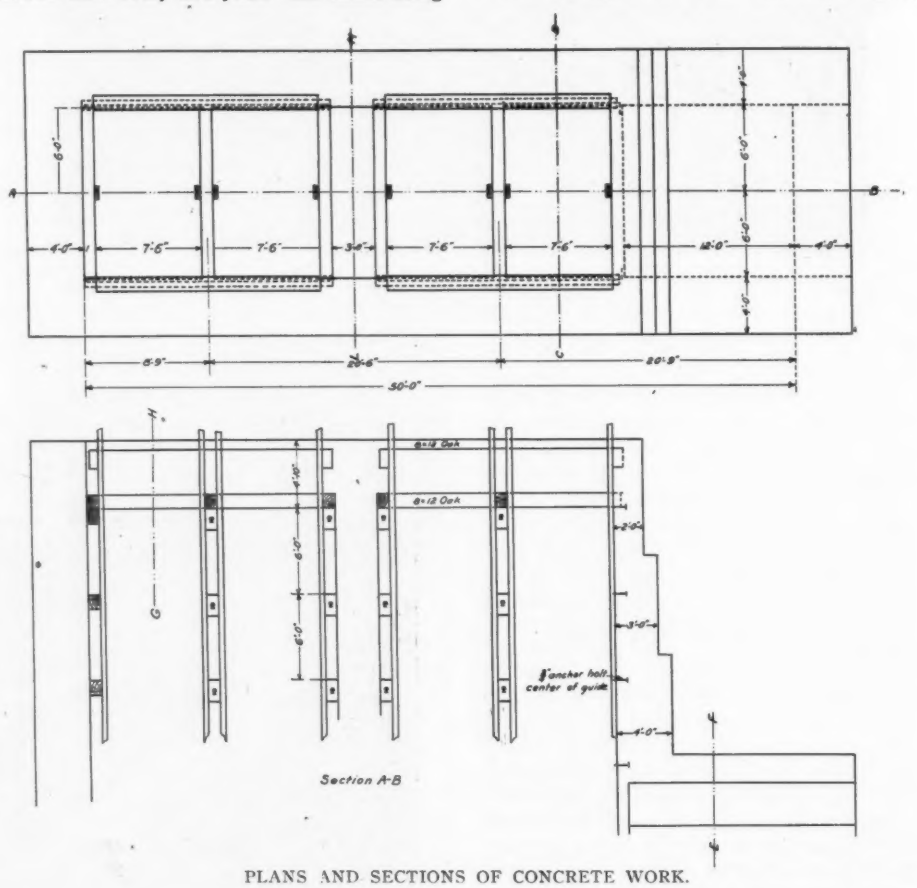
These three equations constitute the main reactions in the precipitating tanks.

While the liquor is fairly strong in copper, the copper is mostly precipitated in a coherent form, but in the later stages, as the liquor becomes impoverished, it is precipitated in a powdery state—a condition which is more effective in its galvanic action with the iron, and thus, unfortunately, causes a larger precipitation of arsenic and other impurities than in the earlier stages. In the later stages, also, the "solution reaction" of iron in sulphuric acid, as given in formula No. 5, goes on to a proportionately greater extent than does the precipitation of copper, and consequently the cost of pig-iron in precipitating the copper varies inversely as the quantity of copper in the liquor.

By keeping careful watch on the reduction of the ferric iron before the liquor enters the tanks, and by giving it sufficient velocity through the tanks, a strongly acid liquor such as given above will not consume, per annum, more than 1.4 units of pig-iron (containing 92 per cent iron) to 1 unit of copper precipitated. A valuable check can be maintained in the laboratory, by analyzing the liquors before entering and after leaving the tanks.

A CONCRETE LINED SHAFT.

Probably more mine shafts have been lined with concrete in the anthracite coal regions of Pennsylvania than in any other mining region in America. There are, of course, several reasons for this. The shafts so lined have been sunk within the last 10 years, and are intended for hoisting coal, and possibly water, from a considerable area. As the amount of coal to be extracted can be determined with a considerable degree of accuracy beforehand, it is possible to say how long the shaft will be wanted, and it thus becomes a more permanent investment than a shaft sunk to work an irregular and uncertain quartz vein or metalliferous deposit, and justifies large initial outlay for the advantages of a durable construction. Owing to the increasing cost of timber and the fact that in some shafts the cribbing must be renewed once every five years—the mines being idle meantime—the final cost of shaft timber is greater than it seems, at first thought.



PLANS AND SECTIONS OF CONCRETE WORK.

One of the first coal mining companies to use concrete for shaft lining was the Delaware, Lackawanna & Western. Its two deep shafts at the Auchincloss colliery, near Nanticoke, sunk some seven or eight years ago, are lined with concrete to a depth of about 100 ft. Since then the company has lined a number of shafts with concrete to greater or less depths, and has been the first to use expanded metal in connection with this work. It has been stated that a deep shaft the company is now sinking will be lined with concrete to a depth of over 700 feet.

One of the largest, though by no means the deepest, of the new shafts in the anthracite region, is the Grassy Island shaft of the Delaware & Hudson Company near Olyphant. This shaft will be nearly 800 ft. deep, and will be 50 ft. long and 12 ft. wide, in the clear. It will take the coal from several seams, at depths of 610 to 780 ft. It has four hoisting compartments 7.5 by 12 ft., a pipe and ladder compartment 3 by 12 ft., and an air compartment 12 ft. square. The shaft is now down about 650 ft. Sinking was temporarily stopped by a strike of the rock-men, which did not interfere with the concrete work.

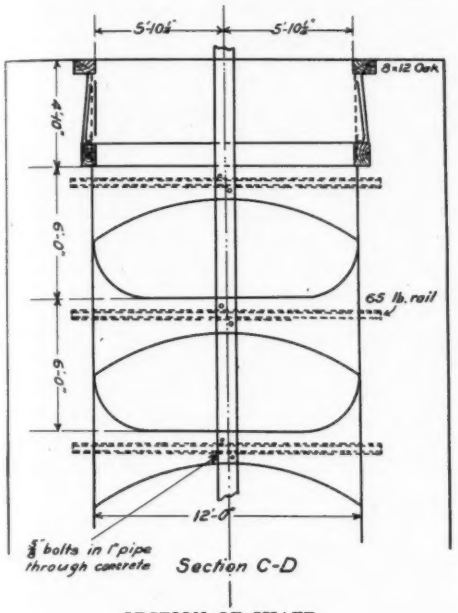
This work has some interesting features, and hence is described in some detail. The shaft is situated on a hill-side, the rock strata dip into the hill at an angle of about 15°, and the depth of the overburden of clay, sand and boulders varies from 20 to 50 ft. The upper strata are soft and include a seam of coal about 5 ft. thick, with an underlying bed of fire-clay shale. The company decided to carry down the concrete lining below this shale, making the lining, on one end, down about 40 ft. in rock, but on the down-hill end of the shaft only about 20 to 25 ft.

Like all large shafts in the anthracite region, its length is parallel to the line of dip—thus offering the greatest resistance to pressure from any movement of ground. It was sunk by the company, and the contractors had little difficulty in removing the timbering and placing the concrete; not nearly as much as in a shaft at Jesup, not far distant, sunk through quicksand, where, on account of the piling and the heavy timbering, the work of putting in the concrete was very slow and difficult. The outside dimensions of the Grassy Island shaft, as far down as concrete lining was to be used, were 58 by 20 ft., the concrete being about 4 ft. thick.

The concrete used is made of five parts of coarsely broken sandstone or grit, from a near-by rock dump. The rock was broken by a Blake crusher to about a 3-in. ring, and mixed with two parts of clean sand and one part of Lehigh portland cement. In mixing on a platform at the shaft mouth, the rock was thoroughly wet, then mixed by hand labor with the portland

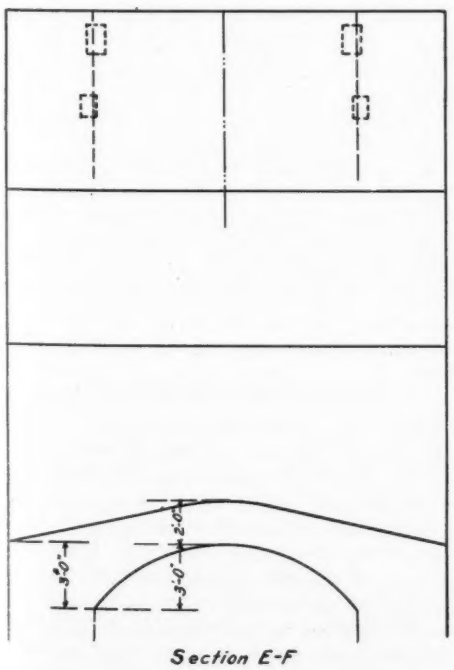
cement and sand, these having been previously mixed, also by hand labor, in a mixing box. Especial care was taken to mix the concrete pretty dry, that is, simply moist, not wet, this being necessary for the best results.

When mixed, the concrete was shoveled down chutes so arranged as to deposit the concrete near where it was needed. This use of chutes has been criticized by some engineers, who claim that concrete should be either mixed on a



SECTION OF SHAFT.

temporary platform in the shaft, and shoveled off this platform into the space between the rock and the planking, or, if mixed on the surface, should be lowered in buckets, because of the well-known tendency of rock and mortar to separate when sliding down a chute. However, in this case, the contractors used chutes



SECTION OF SHAFT.

with an elbow near the bottom, and by this elbow the rock and mortar were still well mixed when they fell on the platform. The cement was shoveled into the space between the rock wall and the planks, and well tamped as fast as put in, thorough tamping being absolutely essential to a tight and durable lining.

Before concreting began, the rock walls of the shaft had been thoroughly cleaned by a stream of water under a head of 100 ft. or more. This removed all slime and ooze, and also many loose pieces of rock. To keep water from accumulating behind the concrete, and, under pressure, eating its way through while the concrete was still green, making a leaky job, pieces of 1-in. pipe were put in at intervals where the flow is heaviest. When the concrete had set, the pipes were plugged first with waste soaked in tar, then with good cement mortar rammed in hard. As a result the lining does not show a leak.

The anthracite style of timbering was put in by the company, but for the lined part of the shaft concrete buntons 10-in. thick were used instead of wood. These concrete buntons are of the shape shown in the accompanying cut. To fasten the wooden guides to the buntons iron bolts are used, but these are not, as in some recent shafts with concrete buntons, imbedded in the concrete. Instead, two pieces of 1-in. pipe were put through each bunton through which the bolts run. This method of fastening the guides is a distinct improvement, since, if the bolts are embedded in the concrete, and the head of a bolt rusts off, there is trouble in again fastening the guides, while in this case the replacing of a broken bolt is very easy. That the concrete buntons may not get out of shape while the concrete is setting, and to add to their strength, a piece of old 65-lb. rail is enclosed in the concrete, as shown in the diagram.

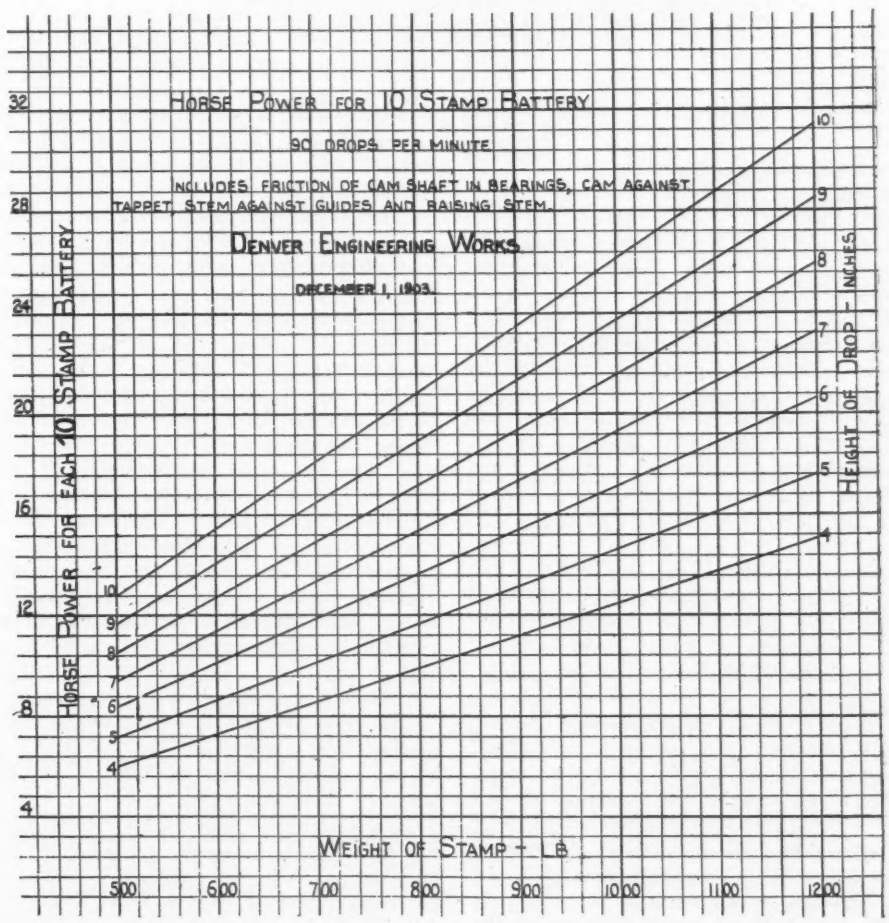
From a point some 30 ft. below the top of the shaft is a tunnel reaching from the airway to where the fan will be. The accompanying cuts give the plan and longitudinal and vertical cross-section of the shaft.

In the temporary timbering for placing the concrete the timbers at the corners of the shaft were very heavy, 10 by 10-in. Intermediate timbering was lighter, 4 by 6 in., while 2 by 12-in. planks were used for the rest of the work. Owing to the setting of the concrete, the timbering in work like this is continually getting out of place, and requires the strictest supervision. Hence, besides a good foreman, a skillful and experienced carpenter is needed to keep the alignment exact. The contractors who have been doing this particular work, Reese D. Isaacs & Son, of Wilkes-Barre, have lined a number of anthracite shafts, including the one at Jessup mentioned above. No attempt was made, in lining the shaft here described, at a record for speed, since the Delaware & Hudson Company will not use the shaft for some time.

HORSE POWER FOR TEN-STAMP BATTERY.*

BY FRANK E. SHEPARD.

Modern practice in stamp mills includes the use of stamps with weights varying from 500 to 1,200 lb. per stamp, and height of drop varying from 4 to 10 in. The diagram herewith shows the horse-power required for each 10-stamp battery for weights of stamps and heights of drop between the limits mentioned. This diagram is based upon 90 drops per minute, and includes the friction of the cam-shaft



in the cam-shaft bearing, the friction of the cam against the tappets, the friction of the stem against the guides, and the power required for raising the stem vertically. The

*Abstracted from the *Bulletin*, of the School of Mines, Colorado; January, 1904.

diagram shows a line for each height of drop from 4 in. to 10 in. inclusive.

To explain the use of this diagram, we give the following example: Required the horse-power to drive a 10-stamp battery of 900 lb. stamps, dropping 90 drops per minute, height of drop being 7 in. Find the figure 900 at the bottom of the diagram under weight of stamps, follow this line vertically until it intersects the 7-in. drop line, then proceed in a horizontal line to the left of the diagram, where it will be found that the required power for each 10-stamp battery is about 17.4 horse-power.

Another use of the diagram is in finding the change in horse-power by varying the height of drop without changing the weight of the stamp. For example, with a 900-lb. stamp, in changing the drop from 7 to 8 in., the increase in power for each 10-stamp battery is from 17.4 to 19.4 horse-power.

The above powers are determined on the assumption that the bearings are properly lubricated and the stems in good alignment.

MINERAL PRODUCTION OF ONTARIO.

We are indebted to Mr. Thomas W. Gibson, Chief of the Bureau of Mines, for the following table, showing the mineral production of the Province of Ontario for the year 1903. The tons used are short tons, of 2,000 lbs.:

Mineral Production of Ontario, 1903.

Product.		Quantity.	Value.
Metallic—			
Gold	oz.	10,383	$188,036
Silver	"	16,688	8,949
Copper	tons	5,331	716,726
Nickel	"	6,998	2,499,068
Iron ore	"	208,154	450,099
Pig iron	"	87,004	1,491,696
Steel	"	15,229	304,580
Lead	"	.....	1,500
Molybdenite	"	85	1,275
Zinc ore	"	1,150	17,000
			$5,678,929
Less value iron ore smelted into pig iron and pig iron converted into steel		.....	436,354
Net value metallic production		.....	$5,242,575
Non-metallic—			
Actinolite	tons	550	$1,650
Arsenic	"	257	15,420
Tile, drain	No.	18,200,000	227,000
Brick, common	"	230,000,000	1,561,700
" paving	"	3,788,800	45,288
" pressed and terra cotta	"	23,702,610	218,550
Building and crushed stone		.....	845,000
Carbide of calcium	tons	2,507	144,000
Cement, natural rock	bbl.	89,549	69,319
" portland	"	695,260	1,182,799
Corundum, grain	tons	849	84,900
" cobbed	"	270	2,700
Feldspar	"	15,296	20,046
Graphite	"	4,400	20,636
Gypsum	"	4,520	7,910
Iron pyrites	"	7,469	21,693
Lime	bush.	3,400,000	520,000
Mica	tons	948	102,205
Natural gas		.....	196,535
Peat fuel	tons	1,100	3,300
Petroleum	imp. gal.	16,640,338	.....
Illuminating oil	"	7,096,073	
Lubricating oil	"	2,614,313	
Benzine and naphtha	"	832,153	
Gas and fuel oils and tar	"	1,968,172	1,586,674
Paraffin wax and candles	lb.	2,673,806	
Pottery		.....	160,000
Salt	tons	58,274	388,097
Sewer pipe		.....	199,971
Talc	tons	920	2,625
Total non-metallic production		.....	$7,628,018
Total production		.....	$12,870,593

Mr. Gibson's remarks on the facts shown by the table are as follows:

The figures given above relate only to the quantity and value of the various products, other details, as well as comment on the several branches of the mining industry being reserved for the *Thirteenth Report* of the Bureau of Mines, now in course of preparation. The table now presented is not necessarily final in all respects, but it is believed the statistics are a close approximation to accuracy. The aggregate output for 1903 is less in value than that for 1902 by $521,041. Metallic products fell off by $1,014,924, while non-metallic products show an increase of $493,883; the net reduction being about 4 per cent of last year's total.

The values of all the items in the metallic list are lower except nickel, copper and zinc ore, but the chief reduction was in steel, which fell from $1,610,031 to $304,580. The large output of 1902 was due to the fact that the Algoma Steel Works were in operation for part of that year, while in 1903 they remained closed throughout, and consequently the production of steel fell to about the former level. Iron ore exhibits a diminished yield both in quantity and value, the output in 1903 being 208,154 tons, worth $450,099, as compared with 359,288 tons, worth $518,445, in 1902. This reduction was also one effect of the paralysis which fell upon the great industries at Sault Ste. Marie, and which led to the closing of the Helen iron mine before the shipping season was over. The blast furnaces of the Province turned out 25,683 tons of pig iron less in 1903 than in 1902, the value of the product being less by $191,355. Of the iron ore smelted into pig iron, 32 per cent came from Ontario mines and 68 per cent was imported from the United States.

The yield of gold decreased by $41,792, and of silver by $49,051. The production of copper (in ore and matte) was greater than in 1902 by 471 tons, the increase in value being $36,643. The chief source of copper remains the nickel-copper mines of Sudbury, but the purely copper ores of the Massey Station mine are now being smelted, and ore is also being raised at the Superior and Tip-top mines. The output of nickel was larger last year than ever before, exceeding that for 1902 by 1,053 tons in quantity and $288,107 in value. The production of 6,998 tons of nickel constitutes a record, and undoubtedly confers upon the Sudbury district the distinction of being the chief source of the world's supply of this metal. As usual, the Canadian Copper Company was the principal producer. The reduction works of this company are at present being extensively overhauled and re-modelled, with the view of producing high-grade matte by the bessemer process. Other concerns contributing to the total were the Mond Nickel Company and the Lake Superior Power Company. Lead re-appears in the tables for the first time in many years, a small furnace having gone into experimental operation near Bannockburn, in Hastings county, about the close of the year. Some molybdenite was also raised in the same country.

The substances comprised in the non-metallic list show in some cases considerable fluctuations from the level of 1902, but the footing-up renders apparent an increase on the whole of about 7 per cent.

Carbide of calcium gained 1,105 tons in quantity and $54,580 in value, testifying to the growing popularity of lighting by acetylene gas, notwithstanding some mishaps which resulted from its use during the year. There was a small gain in corundum, which is of abundant occurrence in Hastings and Renfrew counties. Two companies are now producing the crushed and sized article, with prospects of a third. The pioneer concern, the Canada Corundum Company, is erecting and equipping a new plant of much greater capacity than its old one. Feldspar was in good demand, and the shipments for 1903 were in excess of those for 1902 by 6,520 tons in weight and $7,171 in value. It is all exported to the United States, where it is used in the manufacture of pottery, and for glazing tiles, baths, enamelled ware, etc.

There were raised 3,098 tons of iron pyrites, principally in Hastings county, more than in 1902, and the aggregate production was greater in value by $6,700. The output is sent to United States markets, principally Buffalo and Cleveland, for the manufacture of sulphuric acid.

The yield of mica as returned to the bureau was almost exactly the same as in 1902. The production of this article is now confined, more largely than formerly, to companies working on an extensive scale; and since the introduction of micanite, in which the smaller sizes are utilized, the demand is not so much for size as for quality.

The value of natural gas produced last year was very little less than in 1902. Much the larger proportion now comes from the Welland field, that in Essex county being practically abandoned. A pool at Dunnville, in Haldimand, is being exploited, and gas is also now being taken from the White Medina formation at Brantford.

Petroleum, of which the Lambton county oil-fields remain the chief source, is steadily declining in point of yield. Compared with 1902, the production of crude for 1903 was 1,545,254 imperial gal. less, while compared with 1893 it was 17,414,662 gal. less. In 10 years, therefore, the quantity of crude product has fallen off over 50 per cent. The higher prices which prevailed last year, however, prevented the value falling with the production; indeed, there was a marked increase, taking as a basis petroleum products and crude petroleum used for gas and fuel, amounting to $155,620. It is a legitimate subject of inquiry whether there are not yet undiscovered reservoirs of both petroleum and gas in this Province. The supply of the former has heretofore been taken wholly from the limestones of the Corniferous formation, in which it is found at a depth of about 470 ft. from the surface. Borings have been made to the Trenton, but without much success; recently, however, oil has been found in considerable quantity in the southwest corner of Kent county at a depth of 1,290 or 1,300 ft., in what is believed to be the Guelph formation, and more recently still at Brantford, oil has been struck in the White Medina between 500 and 600 ft. below the surface.

Salt continues to be raised in about the same quantity from year to year from the widespread beds lying east of lakes Huron and St. Clair. In 1903 the output was somewhat less in quantity and greater in value than in 1902.

In building and construction materials, lime and stone both show a decrease in value, the former of $175,000 and the latter of $97,000. These losses are largely offset by an increase in the value of brick amounting to $175,000, the result of active building operations in many centers. There was a further expansion in the quantity and value of cement manufactured in 1903, as compared with the previous year. Natural rock cement increased in quantity by 12,249 bbl. and in value by $18,524, while portland cement showed gains respectively of 172,361 bbl. and $266,578. The develop-

ment of the portland cement industry in Ontario, since its commencement in 1891, has been remarkable. In that year 2,033 bbl. were made, worth $5,082; in 1894 the output was 30,580 bbl., valued at $61,060; in 1897 it was 96,825 bbl., worth $170,302; in 1900, 306,726 bbl., worth $598,021; and in 1903, 695,260 bbl., valued at $1,182,799. Few industries can show a record equal in rapidity and steadiness of growth. The cheapness of cement and the multifarious uses to which it is now being put, ousting, as it is to a greater or less extent, lime, brick, stone and wood, have led to an enormous demand. This, in turn, has called into being an industry fast attaining high rank in value of output and amount of invested capital. There were nine producing plants in 1903, five others were approaching completion and will probably place their product on the market during the present year, and one or more companies are in process of organization. The market in Canada is, however, not unlimited in extent, and imported cement, mainly from the United States, is competing severely with the native article at the present time. It would be a pity to overdo the cement business, and there are not wanting signs that the point to which expansion can, for the time being, profitably or safely go, has been reached, if not passed.

The only other substance which calls for special mention is peat fuel, of which some 1,100 tons were manufactured by two separate plants last year. The product has given satisfaction, and a larger output may be expected. It is to be hoped that ere long peat fuel from Ontario bogs will largely replace anthracite, imported from Pennsylvania, in the kitchen ranges of the Province—a use for which it is eminently fitted.

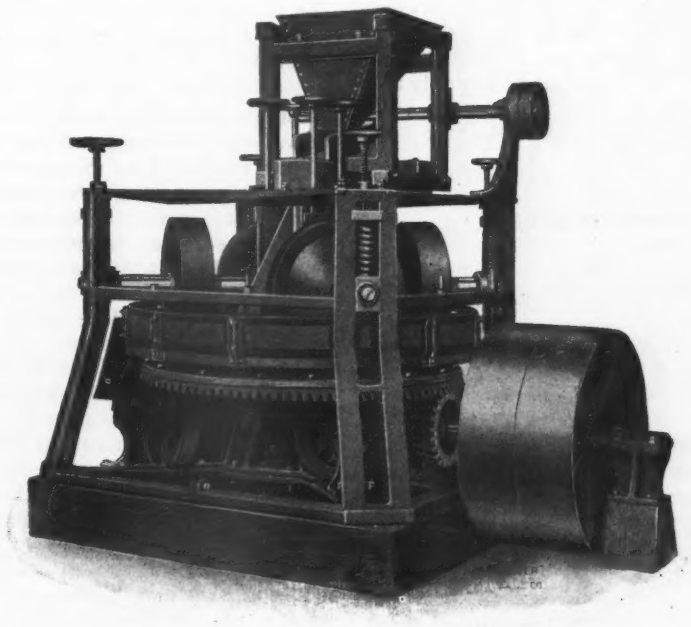
The ton used in the foregoing table is the statutory ton of 2,000 lb. Values have been computed at the selling price at point of production. The aggregate value, especially of the metalliferous products, could have been greatly swollen had the computation been on the basis of the market price of the refined metals. In the case of nickel and copper alone, the additional sum claimed would have amounted to at least $3,600,000. But it seems preferable to give the actual value, as nearly as this can be ascertained, in the form in which the metals are sent out of the country, seeing that the additional value conferred upon them by separation and refining has its origin elsewhere, and is not the product of Canadian labor or Canadian skill.

THE ELSPASS QUARTZ MILL.

The accompanying illustration shows a new quartz mill of the Chilean type, called by the makers the Elspass quartz mill. This mill has been on the market for about two years, and is operating in Mexico, Arizona, New Mexico, Colorado and other mining sections. Contracts have been made in the past 60 days for 12 mills, to be distributed in the Black Hills, Oregon, Idaho, Colorado, Nevada and Arizona.

This mill discharges more freely than any other mill of its kind, owing to the fact that the flow of pulp is directed against the screens by the use of plows between the mullers or rollers; it has 21 linear feet of screen surface. The die revolves and the rollers or mullers are stationary, making a perfect panning motion. In the treatment of gold ores, the gold settles on the shelf, or gold receptacle, and is retained there by the action of the wash-water, while the gangue and lighter minerals issue through the screen. It is claimed that it requires less power to do the same amount of work than any other mill.

These points in connection with the gold saving in the mill without the use of mercury, freedom from slimes, small cost of renewing tires and dies, and uniform product, are a few of the features, which, the makers claim, deserve the attention of mining men who are interested in up-to-date crushing. It is made by Fairbanks, Morse & Company, of Chicago, that company controlling the patents.



THE ELSPASS QUARTZ MILL.

GERMAN STEEL PRODUCTION.

The German Iron & Steel Union reports the production of steel in Germany in 1903 as follows, in metric tons:

	Acid.	Basic.	Total.
Converter ingots...	435,327	5,473,195	5,908,522
Open-hearth ingots..	132,693	2,628,544	2,761,237
Castings	45,379	86,377	131,756
Total	613,399	8,188,116	8,801,515
Per cent.....	7.0	93.0	100.0

Dividing the steel again according to methods of manufacture, we find that 67.1 per cent of the total was converter steel; 31.4 per cent open-hearth, and 1.5 per cent steel castings.

The production of steel ingots for four years past has been as follows:

	Acid.	Basic.	Total.
1903.....	613,399	8,188,116	8,801,515
1902.....	517,996	7,262,686	7,780,682
1901.....	465,040	5,929,182	6,394,222
1900.....	422,452	6,223,417	6,645,869

The increase last year over 1902 was 1,020,833 tons; over 1901, it was 2,407,293 tons; and over 1900, it was 2,155,646 tons.

It will be seen that the Thomas, or basic converter, process continues to predominate in German practice. This will be the case as long as Germany depends largely upon the high-phosphorus minette ores for its supply.

LOW COAL CONSUMPTION AT A COLLIERY.—At the Seghill colliery, Durham, England, where superheated steam is used by the engines, the consumption of coal for power is stated to be but 1 per cent of the colliery output.

RECENT LITERATURE ON ECONOMIC GEOLOGY—X. GOLD AND SILVER.

By F. L. RANSOME.

The Mineral Resources of the Mount Wrangel District, Alaska. By Walter C. Mendenhall and Frank C. Shrader. *Professional Paper* 15, United States Geological Survey; 71 pages, 10 plates and maps.

The Mount Wrangel district is situated in southern Alaska, northwest of Mount St. Elias and adjacent to the international boundary. It embraces the Chistochina, Delta river, Nizina, Bremner, Tiekel and Tonsina gold fields. The gold thus far obtained comes chiefly from placers along the present stream-beds, and in a few cases from bench gravels up to a height of 200 ft. above the existing channels. The Chistochina field has been most productive, and is credited with a total output of $365,000. The gold of this field is thought to have come from small quartz stringers in the metamorphosed Permian shales constituting the bed-rock. The other gold-fields described are as yet unimportant, the gravels having not proved sufficiently rich to offset the difficulties involved in exploitation.

Mineral Deposits of the Bitter Root Range and Clearwater Mountains, Montana. By Waldemar Lindgren. *Bulletin* 213, United States Geological Survey, pages 66-70, 1903.

The area covered in this reconnaissance is bounded on the south by the Salmon river and on the north by the North fork of the Clearwater. It is a wild, mountainous region, lying between the fertile Bitter Root valley on the east and the lava plateau of the Columbia river on the west.

The main Bitter Root range and the larger part of the Clearwater range consist of a vast intrusive mass of granite, cut off by a great fault along the eastern face of the Bitter Root range. Near the eastern edge of this granitic area are some masses of quartzite and slate of Cambrian or pre-Cambrian age, while along the western border are slates, limestones and greenstones. These rocks, as well as an older gneiss occurring in the Clearwater range, are all intruded by granite.

The gold deposits occur as fissure veins and as associated placers derived from the disintegration of these veins. There are two principal belts of mineralization—one along the west side of the Bitter Root range and one along the western foot of the Clearwater mountains. The first belt contains copper, lead and silver as well as gold, while the second, or western, belt is chiefly auriferous, and contains the well-known placers of Elk City and Florence, in Idaho. The Buffalo Hump district, discovered in 1898, is on the high divide between the Salmon and the Clearwater.

Nearly all of the veins in this region occur in granite or gneiss, chiefly near the eastern and western margins of a great central granitic area, which seems to be generally barren of valuable deposits. The quartz veins were probably formed in late Mesozoic time.

BOOKS RECEIVED.

In sending boooks for notices, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

Censo y Division Territorial del Estado de Guanajuato. Compiled by Dr. Antonio Peñafiel. Mexico; published by the Secretaria de Fomento. Pages, 420.

A New Occurrence of Unakaite. By W. C. Phalen. Washington; the Smithsonian Institution. Pamphlet, 8 pages; with plates.

The Economical Burning of Coal Without Smoke. By A. Bement. Chicago; the Peabody Coal Company. Pages, 48; illustrated.

Statistics of the Colony of New Zealand for the Year 1902. Compiled in the Registrar-General's Office. Wellington, N. Z.; Government Printer. Pages, 600.

Reports of the Mosely Educational Commission to the United States of America. 1903. London, England; the Co-operative Printing Society, Ltd. Pages, 400; illustrated.

Industrial Statistics of Mexico.. Compiled by Dr. Antonio Peñafiel for the Direction General de Estadistica. Mexico; published by the Secretaria le Fomento. Pages, 132.

Twentieth Century Handbook for Engineers and Electricians. By C. F. Swingle, Henry C. Horstman and Victor H. Tously. Chicago; Frederick J. Drake & Co. Pages, 220; illustrated.

United States Geological Survey. Monograph XLVI. The Menominee Iron-bearing District of Michigan. By William Shirley Bayley. Washington; Government Printing Office. Pages, 514; illustrated.

The Foreign Commerce and Navigation of the United States in the Year Ending June 30, 1903. *Volume* I. Prepared in the Bureau of Statistics. O. P. Austin, Chief of Bureau. Washington; Government Printing Office. Pages, 976.

Geologic Atlas of the United States. No. 102. *Indiana Folio, Pennsylvania.* Five maps and 8 pages text. *No.* 104. *Silver City Folio, Idaho.* Three maps and 7 pages text. *No.* 105. *Patoka Folio, Indiana-Illinois.* Four maps and 12 pages text. Washington; engraved and printed by the United States Geological Survey.

United States Geological Survey. Bulletin 221. *Bibliography and Index of North American Geology, Paleontology, Petrology and Mineralogy for the Year* 1902. By Fred. Boughton Weeks. Pages, 200. *No.* 222. *Catalogue and Index of the Publications of the Hayden, King, Powell and Wheeler Surveys.* By L. F. Schmeckebier. Pages, 208. Washington; Government Printing Office.

BOOKS REVIEWED.

The Copper Manual. Third Yearly Volume, 1904. Prepared by D. Houston & Company, New York; D. Houston & Company. Pages, 456; illustrated. Price, $3.

This useful manual, which is already well known to those who have found the previous volumes convenient for reference, appears this year in a slightly enlarged form, and with some additional information. It is, of course, brought up to date, so far as statistics and reviews are concerned. It contains general reviews of copper production; reviews of the New York and London markets, and of the markets for copper mining company's stocks; statistics of production in the United States and abroad, and specific information about a large number of copper companies. Most of these figures are derived from the annual reports published by the companies, and from official sources wherever possible. It is indispensable to those who are engaged in the copper trade. It is generally carefully compiled and reliable, and perhaps the only improvement that could be suggested is a little more system in the arrangement of the matter. This objection, however, is partly overcome by a very complete index, which enables one to find quickly the special information desired. It is illustrated by views of copper mines and works, and by a number of excellent portraits of men prominent in mining and trading in copper. Prominent among these we find, naturally, excellent likenesses of John Stanton and James Douglas.

A Treatise on the American Law Relating to Mines and Mineral Lands Within the Public Land States and Territories, and Covering the Acquisition and Enjoyment of Mining Rights in Lands of the Public Domain. Second Edition, 1903. By Curtis H. Lindley. San Francisco; The Bancroft-Whitney Company. In two volumes; Volume I, 936 pages; Volume II, 1216 pages. Price (for both volumes), $15.

It is now over six years since the first edition of Mr. Lindley's treatise on mining law appeared, long enough to establish its reputation for the thorough treatment of the questions involved, the care with which it had been prepared, and its general reliability. Since the first publication, some questions of large importance have been passed upon by the courts, requiring in some instances modification, and in others elaboration, of the text, so that the time appeared to have come for a new edition. The work has been entirely revised, and in some parts re-written. As a matter of convenience, however, the original section numbers have not been changed. The new adjudications have been assimilated to the old sections, and where new subjects have been incorporated, supplemental sections have been drafted appropriately into the treatise, without disturbing the general plan of arrangement, or the logical sequence of the sections. Where the subject would seem to justify or require it, additional diagrams and illustrations have been utilized. In the citation of cases in the notes to the text the official report is given, followed by a reference to the series of Federal or State reports in which the decisions are given. In the table of cases references will be found to all standard reports, in which the case appears.

It is not necessary to criticise a work like this, which is established as a standard authority. The new edition is timely, and well up to date, and is certainly indispensable to all who are concerned with mining law.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

The Use of Metallic Currency.

The Editor.

Sir.—I was much interested by Mr. George J. Bancroft's letter on this subject, published in the JOURNAL for March 31. His points are good ones; especially that about the greater safety of a metallic currency. There is no doubt that paper money does carry infection in numerous cases. It certainly carries dirt, and smaller bills often get into such a filthy condition that a clean man really is reluctant to receive or handle them. Of course, we must have paper, to provide us with sufficient circulating medium; but bills ought to be restricted to the larger denominations, which do not receive so much handling. For anything below $10, or even $20, coin is, from all points of view, much to be preferred. There is gold enough and silver enough in the country for current use. The usual objections as to weight and inconvenience will be brought up, but they are really of little value. They represent only laziness and that inertness and opposition to change of any sort, which most men possess, though they do not like to be told so. We are accustomed now to the use of silver for small change, and do not complain about it. The addition of a few gold pieces—for most of us, alas! they would be very few—could not add much to the burden. Surely the gold would be put to better use circulating among the people, than locked up in government or bank vaults.

There is another side to this question, and that is that the very large number of people who do not think get a sort of hazy idea that paper money has value in itself—that is, intrinsic, not merely representative, value. But this is getting too near political and politico-economical questions, which you do not consider quite in your field.

By all means, let us have more coin, and let the miner have the benefit of the loss from abrasion and the like. For my part, I should not be sorry to see the issue of all bills of less denomination than $10 stopped, and the place of the small bills taken by coin. Mr. Bancroft's case of the San Francisco Chinamen, who will not use bills, shows that there are points in which the Chinese show common sense. Let us put the gold into circulation, where it belongs. GOLD MINER.

Lead, S. Dak., April 10, 1904.

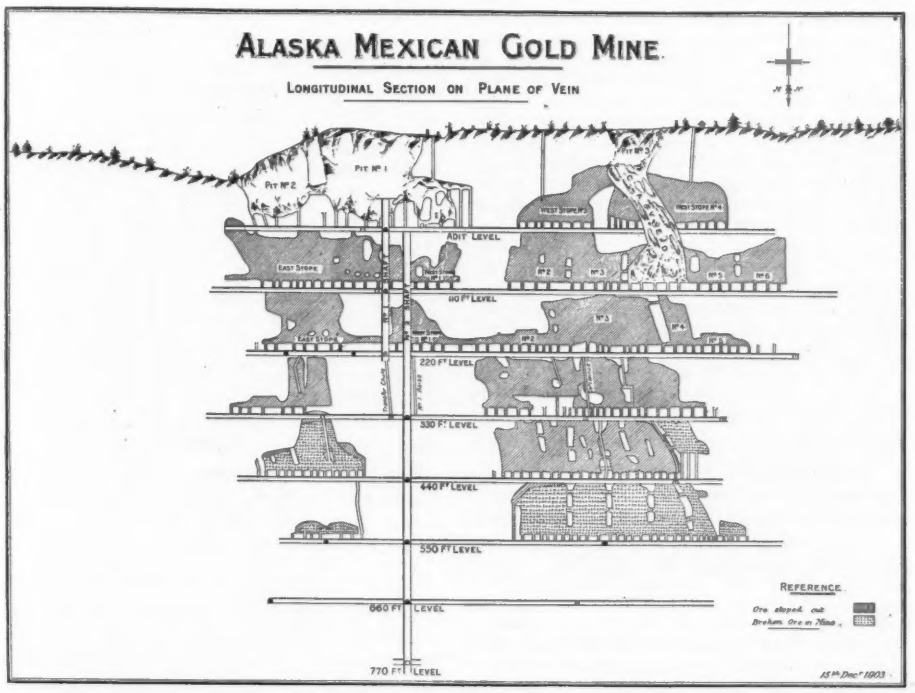
ABSTRACTS OF OFFICIAL REPORTS.

Alaska Mexican Gold Mining Company.

This company operates a large deposit of low-grade gold ores on Douglas Island in Alaska. The report is for the year ending December 31, 1903. The capital stock is $1,000,000 in 200,000 shares of $5 each. Of this stock 180,000 shares have been issued, 20,000 shares being held in the treasury of the company.

The financial statement for the year shows results as follows:

	Amount.	Per ton.
Bullion from mill	$337,803	$1.4108
Bullion from sulphurets treated	361,582	1.5100
Total receipts	$699,385	$2.9208
Mining ore	$308,140	$1.2868
Milling and concentrating	66,183	0.2764
Treating sulphurets	36,514	0.1525
General expenses at mine	6,984	0.0292
San Francisco office	2,602	0.0109
London office	645	0.0027
Paris office	112	0.0005
Consulting engineer, expenses	945	0.0039
Bullion charges	3,121	0.0130
Construction costs	16,505	0.0689
Total expenses	$441,751	$1.8448
Net earnings	$257,634	$1.0760



From the net earnings, dividends No. 25 to 30, inclusive, were paid, amounting to $108,000, or 12 per cent on the stock, and the sum of $59,521 was written off property account, making a total of $167,521, and leaving a balance of $90,113. The balance brought forward from previous year was $122,531, making a total surplus of $212,644.

The average value of the sulphurets treated was $71.21 per ton. There were 272 tons sulphurets on hand at the close of the year.

The mill, 120 stamps, ran 356 days 19 hours; 238 days 7 hours by steam, and 118 days, 12 hours by water-power. It was idle 8 days 5 hours. The ore crushed was 239,453 tons, an average of 5.59 tons per stamp per day. The sulphurets saved were 4,982 tons, or 2.08 per cent of the ore crushed. The quicksilver used was: In battery, 61,582 oz.; on plates, 694 oz.; total, 62,276 oz. The supplies used included 380 shoes, 320 dies, 4 cam-shafts, 380 stems broken and repaired, 24 tappets, 24 boss-heads, 2 mortars, 14 cams and 13 vanner-belts. One pound of steel in the shoes crushed 3.66 tons and 1 lb. of iron in the dies, 5.34 tons.

The total rock broken was 281,236 tons, of which 258,471 tons were ore and 22,765 tons waste. The total ore taken out and sent to mill was 239,453 tons. Of this 63.5 per cent came from the 440-ft. level, and 31.4 per cent from the 550-ft. level. The accompanying plan shows the stoping done during the year, and the position of the reserves. The ore blocked out and in sight at the close of the year was 252,416 tons. This does not include anything below the 660-ft. level. There was a total of 469,478 ft. of holes drilled during the year, showing an average of 0.6 ton of rock broken to 1 ft. of hole drilled. The average number of machine drills at work on development was 6.77; tons broken per drill per shift of 10 hours, 9.99. On stoping there was an average of 9.79 drills; tons broken per shift, 32.63. Development work during the year reached a total of 8,327 ft. of which 225 ft. were in sinking shafts; 610 ft. station and skip chutes; 543 ft. cross-cutting; 4,480 ft. drifts; 2,439 ft. raises.

Accidents included 1 man killed and 1 hurt by explosives; 1 killed and 2 injured by falls of rocks; 1 killed by falling down shaft; 2 killed by suffocation by gas; 1 injured by a drill falling and 1 by a mine car; a total of 5 killed and 5 injured. Labor was plentiful during the year, with the exception of machine-drillers.

The cost of explosives per ton of ore broken was as follows, in cents:

	Bulldozing.	Machine drilling.	Total.
Powder, 70 per cent.	10.93	1.76	12.69
Powder, 40 per cent.	2,73	8.95	11.68
Fuse	0.50	0.52	1.02
Caps	0.21	0.24	0.45
Total	14.37	11.47	25.84

The total cost of explosives for the year was $72,699, including explosives used in shaft

As the salt water pumps were situated at the end of a trestle over the sea at a distance of 420 ft. from the mill, it was often impossible to reach them during stormy weather. They were, consequently, removed and placed in a caisson sunk below mean high tide level close to the mill. A trestle, 538 ft. long, was built to carry the suction pipe out to deep water. By this arrangement the mill engineer can care for the pumps conveniently.

United Alkali Company.

Forty-six individual concerns are now controlled by the United Alkali Company, formed in 1890 with £6,000,000 share-capital and £2,500,000 in 5 per cent mortgage bonds, to purchase and consolidate the chemical works operating in the United Kingdom. At present the share-capital consists of £2,893,430 ordinary stock, and £2,825,240 in 7 per cent preferred; both a par value of £10, while the debentures now amount to £2,741,560.

During the 13 years of its existence the company has paid only 19 per cent in dividends on its ordinary shares, which, by the way, have yielded nothing since 1896, when 2 per cent was declared, making the total distribution £548,959. The 7 per cent preferred dividend, and the 5 per cent interest on the bonds, have been settled annually, these two items amounting to £4,124,087. Summed up, the dividends and interest paid from 1890 to 1903, inclusive, amount to £4,673,046, which is equivalent to 87.3 per cent of the total net profits of £5,348,719.

Since 1897 the company has suffered severely from German competition and the American tariff. To protect its interests it has made substantial improvements in its various plants; has entered into trade agreements with foreign manufacturers, and has established a plant in the United States. Aside from these contingencies, the company has been burdened with its large capitalization, virtually representing many plants that have long since done no service. True, £700,000 has been written off for depreciation in 13 years, but this amount seems inadequate to compensate for the many improvements that have to be made in order to meet future competition.

The year ending December 31, 1903, was far from satisfactory, particularly as regards the bleaching powder trade, which suffered from active competition with Germany and America, resulting in a smart fall of about 40 per cent in the selling price. About the middle of the year, however, negotiations were entered into which resulted in a temporary trade agreement. Since then prices have improved somewhat, but they are still considerably below the average for 1902. In the other manufactures, deliveries have been fairly satisfactory, considering the restricted character of the markets, but some show lower prices than 1902. In 1903 a pyrite property was purchased in Spain, which, it is thought, will prove in time a source of profit in the manufacturing industry. The American branch of the company is making some money.

The net profits in 1903 were £330,832, which, added to the balance of £80,290 brought forward from 1902, makes a total of £411,122 to be dealt with, as follows: Interest on bonds, £128,197; transfer to debenture redemption fund account, £15,000; dividend on preferred stock, £187,878; carried forward, £80,047.

The plants, equipment, and properties were valued at £8,131,216 on December 31, 1903, and stocks of manufactured products, etc., at £748,311. The debts owing to the company were £267,493; outstanding consignments, etc., £36,819; investments, £474,814; cash and bills receivable, £194,323.

Mohawk Mining Company.

This company operates a new mine in the Lake Superior copper district. The mine was remarkable on account of the discovery in it of fissures filled with a peculiar copper-arsenic mineral, which was named mohawkite. This mineral has heretofore been described in the Journal.

The report for the year 1903 shows earnings and expenses as follows:

	Amount.	Per lb. Copper.
Sales of copper	$823,941	13.11
Sales of mohawkite	14,467	0.23
Interest account	1,223	0.02
Total receipts	$839,681	13.36
Working expenses at mine	$474,503	7.55
Smelting, freight, etc.	77,646	1.23
Total expenses	$552,149	8.78
Net earnings	$287,482	4.58

To the net earnings is to be added amount received from assessments, $202,825, making a total of $490,307. Deductions were $218,076 for completing and adding to plant, and $18,767 debit balance from 1902; a total of $236,843, leaving a surplus of $253,464 at the close of the year.

A summary of mining results shows 346,365 tons of rock hoisted, of which 57,824 tons were waste. The rock stamped was 288,441 tons, from which the saving was 8,825,500 lb. mineral. The refined copper from this was 6,284,327 lb. The yield of rock stamped was 21.79 lb. refined copper to the ton, or 1.09 per cent. The total working cost was $1.37 per ton hoisted, or $1.65 per ton stamped.

Development work included 582 ft. sinking shafts and 5,610 ft. opening levels. Stoping done was 16,905 fathoms.

President John Stanton's report says: "Regular production began early in January with two heads of stamps, which have worked during the year with but little interruption. It was expected that the third head would go into commission in September, but the delays in receiving machinery, not only for the mill, but also for the equipment of No. 4 shaft which was to supply the head with rock, were so great that it did not begin stamping until the latter part of February of the current year. A 60-drill high duty compressor designed to perform the entire work of the mine, replacing the smaller and less economical machines heretofore employed, is now in course of erection, and when in commission, will furnish air for all the drills that may be required, and the third head will then run on full time. and add 50 per cent to the capacity of the mill.

"The cross-fissures carrying mohawkite have gradually become barren, nothing of value being found below the fifth level, and we have discontinued work on them. The loss of No. 3 shaft-house, by fire, came too late in the year for the construction of a new one, but production was not seriously impeded for want of it, and the loss was covered by insurance.

"It will be remembered that our stamp mill was constructed to contain four heads of stamps. Production was, however, to be started with two heads only, in order that a working test of the mine should be made, and if this should be attended with favorable results, then that two additional heads should be installed whenever it became desirable to do so, the cost of same, with the additional equipment required for increased production, to be provided for—if possible—out of current profits.

"We have united with other companies closely allied in management, in erecting smelting works at a convenient point, which will go into operation about July 1 next. This arrangement will give us lower rates for smelting, as well as better control of our production. The sum of $32,000 has been paid on account of our subscription to the stock of the Michigan Smelting Company, the stock of that company being held by the companies interested, in proportion to their respective production.

"From a map of the mine showing the underground workings, it will be seen that the most southerly shaft, No. 4, is about 5,000 ft. from the south boundary line of the Mohawk property; near which line the Ahmeek mine has recently made openings on the lode, which show unusually rich ground; and this may be considered a favorable indication for that end of our property, in which no openings have yet been made."

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Copper Sulphate.—Can you give me some information as to the means employed for converting old copper scrap into blue vitriol, or sulphate of copper?—C. M.

Answer.—The simplest process consists in boiling the copper—usually cut in small pieces—with sulphuric acid. Sulphurous acid gas is disengaged and copper sulphate formed. The boiling is usually done by steam heat in vats or tanks lined with lead. The sulphate is allowed to crystallize, and the crystals are then washed and sorted for shipment.

Furnace Blast.—Has superheated steam ever been used in place of air in the blast furnace, and if so, with what success? Do you know of any literature dealing with the subject?—R. H. R.

Answer.—We have never heard of any case where superheated steam has been used in the blast furnace, and there would seem to be insuperable objections to such use. The superheated steam would, of course, have to be supplied at a pressure very much higher than is used in any blast furnace, and the results of its use would be very doubtful. We do not know of any literature on the subject.

Sodium Cyanide.—Please inform me whether any modern cyanide plants are using sodium cyanide, instead of potassium cyanide successfully? Has it proved more successful with potassium cyanide? How does it compare in price in large lots with potassium cyanide?—F. W. B.

Answer.—Sodium cyanide has been used, we believe, in some cyanide plants in place of potassium cyanide, but we have no special notes of the actual results obtained. Theoretically, sodium cyanide is somewhat more efficacious as a solvent for gold than potassium cyanide. According to Julian & Smart's 'Cyaniding Gold and Silver Ores,' the theoretical ratio of efficacy is 49 for NaCy to 65 KCy. Very little is said, however, about its actual use. The price of sodium cyanide in large quantities is usually the same as that of potassium cyanide.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

Specially Reported.

When Title to Personal Property at Mines Passes Under Lease.—An owner of mining property, consisting of real estate and personalty, leased it to another for a term of years at a stipulated royalty, and it was agreed that at the expiration of the term the personal property should be returned by the lessee in kind or value, according to an invoice, at the option of the lessor. It was held that this was a sale of the personalty, and the title to same, therefore, passed to the lessee.—Scott Mining & Smelting Company v. Schultz & Clary (73 *Pacific Reporter,* 903); Supreme Court of Kansas.

Limitation on Right of Owner to Follow Ledge Beyond His Own Line.—The right of the owner of a mining location to follow a ledge beyond his side lines is limited to the right to follow the ledge downward—that is, on its dip—and he has not the right to follow it laterally or along its strike; and if there was in A's location the apex of a ledge which left his location by crossing its easterly side-line, and entered B's location by crossing his westerly end-line, and the ledge turned from A's location and entered B's, at such an angle that the portion there could not be reached without following the ledge laterally, or on its strike, then A could not extract ore from that portion.—Southern Nevada Gold & Silver Mining Company v. Holmes Mineral Company (73 *Pacific Reporter,* 759); Supreme Court of Nevada.

Insufficiency of Declaratory Statement in Montana.—Under the law of Montana (Code, sec. 3612) requiring in case of location of a mining claim that there be filed a declaratory statement setting forth the dimensions and location of the discovery shaft, and the location and description of each corner, with the markings thereon, a statement referring to the discovery shaft only by the statement that the claim extends a certain number of feet north and south of the center of such shaft, and to the corner and markings thereon only by the statement that the location is marked by substantial posts of stone at each corner, is not sufficient.

A locator who has not complied with the law, and who has not actual possession cannot have judgment in an action to determine an adverse claim, though the defendants have made no valid location.—Hahn v. James (73 *Pacific Reporter,* 965); Supreme Court of Montana.

Public Lands, Acquired by Treaty, Containing Minerals May be Patented.—Under the laws of Congress, and proclamation of the President opening lands acquired by treaty from the Indians in Oklahoma, none other than one who has been awarded the right to

make the homestead entry after August 6, 1901, was permitted to occupy any of such lands, for the purpose of discovering oils or making mineral locations, until after October 5, 1901, and any entry or occupation prior to such date conferred no rights on the claimant. Public lands, subject to settlement and occupancy, containing petroleum or other mineral oil chiefly valuable for this reason, may be entered and patented, under the law relating to placer mining, and this is true, though they have been classed as agricultural lands; and what they contain is a question of fact, to be proven by claimant.— Bay v. Oklahoma Southern Gas, Oil & Mining Company (73 *Pacific Reporter*, 936); Supreme Court of Oklahoma.

PATENTS RELATING TO MINING AND METALLURGY.

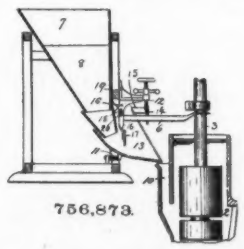
UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending April 12, 1904.

756,821. HOISTING EQUIPMENT.—George W. Bollman, Pittsburg, Pa., assignor to Otis Elevator Company, East Orange, N. J. The combination with the double tracks of a lifting apparatus and with cars traveling thereon, of a cable connected to each car, means for driving the cable alternately in opposite directions, and upper and lower inclined track-sections, of lower grade diverging from the main tracks.

756,873. STAMP-MILL.—William A. Merralls, San Francisco, Cal. A stamp-mill having a battery of vertical reciprocating stamps in alignment, individual intermittently-moving feeders therefor, and means for proportioning the extent of movement



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of each feeder to the excess of stroke of reciprocation, over and above a minimum stroke, of its corresponding stamp-stem, whereby each feeder is entirely controlled by the amount of ore between the corresponding shoe and die.

756,863. MINE-DOOR.—Albert H. Lewis, Uhrichsville, Ohio, assignor of three-fourths to Albert G. Quimby, James C. Shields, and Arthur E. Spear, Uhrichsville, Ohio. The combination of a railway-track, a frame having uprights disposed at opposite sides of the track, an overhead track-rail connected to the frame, and resting above the track, vertical drums carried by the frame, and arranged at opposite sides of the track, a door comprising sections movable on the overhead rail, and flexible sections connected to the sections, and also connected to and adapted to be wound on the drums, a rotary shaft mounted on the frame, connections between said shaft and the door-sections for opening the latter by the former, supports arranged alongside the track and at different distances from the door, a rock-shaft journaled in the support nearest the door, and having a crank, a rock-shaft journaled in the support remote from the door, and having a crank, and also having an arm, a shoe loosely connected to the cranks of the rock-shafts and disposed longitudinally above a rail of the track whereby it is adapted to be raised and moved longitudinally by a wheel passing between it and said rail, a connection between the arm of the rock-shaft and the rotary shaft, and means for moving the door-sections to a closed position subsequent to the passage of a car.

756,868. VALVE FOR BLOWING-ENGINES AND AIR-COMPRESSORS.—Albert K. Mansfield, Salem, Ohio. The combination of an elongated elastic-metal valve-strip fixed at one end and free at the other, with a port bounded by a raised rib having a curved surface affording line-contact with the valve-strip, and a complemental stop or keeper substantially coincident with said valve-strip and fixed at both ends.

756,934. METHOD OF PROTECTING METALS.—Peter J. Burns, Elizabeth, N. J., assignor of one-half to Louis H. Barker, Jersey City, N. J. A method of coating exposed metal work which consists, first, in covering the surface of the metal with a coating of suitable paint; secondly, in applying to said coat of paint while moist and sticky a layer of paper, and, thirdly, in applying a second coat of paint to said paper while the inner coat of paint is still moist.

756,936. COMPOSITION FUEL.—Charles H. Carpenter, Decatur, Ind., assignor to Globe Coal Manufacturing Company, South Bend, Ind. A hereindescribed composition of matter for fuel consisting of clay 900 lb., vegetable refuse 650 lb., sand 225 lb., and powdered rosin 225 lb.

756,945. FEED DEVICE FOR GAS-PRODUCERS.—Victor E. Edwards, Worcester, Mass., assignor to the Morgan Construction Company, Worcester, Mass. The combination in a feeding device for a gas-producer of a coal-reservoir having a hopper-shaped bottom provided with an opening, a depending serrated flange surrounding said opening, a rotating disk beneath said opening and a series of ribs or projections on said rotating disk opposing the serrated edge of said flange.

756,946. FEEDING MECHANISM FOR BILLET-HEATING FURNACES.—Victor E. Edwards, Worcester, Mass., assignor to the Morgan Construction Company, Worcester, Mass. In a furnace for heating billets, the combination with the heating-chamber and a track for billets extending lengthwise through said heating-chamber, of a pushing mechanism for pushing the billets along said track and a pair of feed-rolls one placed above the other and inserted in an opening in the walls of th furnace with their axes within the plane of the inner surfaces of the end and side walls of the furnace, said rolls being arranged to feed a billet transversely to said track and in front of said pushing mechanism.

756,964. PULVERIZING-MACHINE. — Samuel Hughes, Summerville, S. C. In a pulverizing-machine, the combination with a shaft, and a bearing therefor, of a gland on said bearing, packing in the gland, a cup under the bottom of said gland, a split packing-ring secured on the shaft and closing the cup and an elastic packing in said ring.

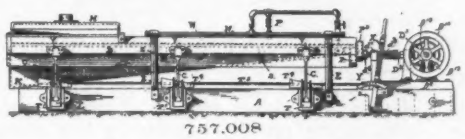
756,972. METHOD OF EJECTING ROCK-CUTTINGS FROM HOLES IN ROCK WHILE DRILLING THEM.—John G. Leyner, Denver, Colo. A method of expelling rock-cuttings from holes in rock during the process of drilling the holes, which consists in simultaneously supplying to the holes during the drilling operation water and air, both under pressure.

756,993. VALVE MECHANISM FOR PUMPS.—Hermann Unzicker, Chicago, Ill., assignor to Charles C. Worthington, Irvington, N. Y. In a pump, an induction-valve mounted within the pump-barrel, a valve-stem on said valve carrying pistons, one of said pistons being adapted to move in a cylinder on the head of said pump-barrel, and the other of said pistons of less area being adapted to move in a passage between said cylinder and said pump-barrel, and valve-controlled connections between said cylinder and a source of supply of fluid-pressure for actuating said piston to operate said valve.

757,002. VALVE FOR REGENERATIVE FURNACES.—James M. Wight and Harry Hyatt, Cleveland, Ohio. In combination, a casing having bottom and side flue-ports, a trough surrounding the bottom port, and a water-cooled valve movable vertically into and out of said trough and having an external water seal in all positions.

757,004. ROCK-BREAKER.—William E. Wild, Denver, Colo. In a rock-breaker, the combination with the sides and rear-end block of a shaft mounted in said side frames having a crank portion between said sides, an arm mounted on said crank portion of said shaft between said side frames, a shaft slidably journaled in said side frames, a walking-beam mounted on said shaft intermediate of its ends, a rock-breaking jaw removably secured on one end of said walking-beam, a knuckle bearing between the opposite end of said walking-beam and said arm, a head-end block slidably mounted between said side frames adjacent to the rock-breaking jaw of said walking-beam, a rock-breaking jaw removably secured to said head-end block, and adjustable yoke-bolts adjustably secured to said sides and rear-end block and arranged in holding contact with said head-end block.

757,008. ORE CONCENTRATOR.—Geo. E. Woodbury, San Francisco, Cal. In an ore-concentrator, a reciprocating table, wooden strips thereon, disposed in parallel rows, and extending from one end of the table-surface for a portion of the length thereof, and a relatively thin metal strip of the same width



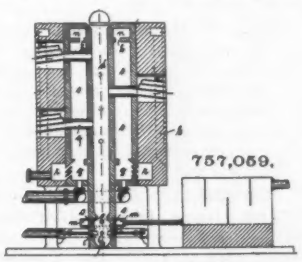
757,008.

as the wooden strip and fastened on the top of the wooden strip, said metal strip extending beyond the wooden strip and being fastened directly on the surface of the table beyond the terminal end of the strip, the extension forming a continuation of the riffle.

757,035. APPARATUS FOR THE MANUFACTURE OF SLAG CEMENT.—Carl Gramm, Frankfort-on-the-Main, Germany, assignor, by mesne assignments, to Henry Edmunds, London. The combination of a rotary distributer, means for conveying material to said distributer, and a rotary table located below the distributer and arranged to receive the material therefrom.

757,036. PROCESS OF PRODUCING CHEMICAL COMPOUNDS.—John J. Griffin, Washington, D. C. A process of producing chemical compounds, which consists in passing an electric current from an anode of a carbide through an electrolyte which reacts chemically on said carbide and which yields an electrolytic product which will react on the product of said chemical reaction to give the desired compound.

757,059. FURNACE FOR PRODUCING ZINC.—Paul Schmieder, Lipine, Germany. In a furnace for extracting zinc, the combination of a vertical receptacle or shaft for the charge of ore mixed with fuel, with a device for heating the upper part of the charge through the walls of said receptacle, a number of condensers or collectors of the liquid



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zinc for this reduction-chamber, a number of tuyeres in the lower part of the shaft which is not arranged to be heated, an oxidation-chamber, a condensing-chamber and opening above the tuyeres and suitable channels for leading the gases from this oxidation-chamber for the slag to the condensing-chamber.

757,069. IMPACT ORE-PULVERIZERS.—James Thame, London, England, assignor to the Oliver Mill Company, Ltd., London, England. In a pulverizing-mill, the combination with a casing, rotary beaters, of a screen within said casing, delivery-outlets in the casing at the front and back of said screen for the dust, and a delivery-receptacle beneath said screen adapted to receive and deliver the graded material.

757,093. CEMENT-MOLD.—Robert B. Coltrin, Jackson, Mich. In a mold, a base and separable side and end members, and adjustable connections between said base and members and between the members for holding them in operative position, which connections permit adjustment of said members and are adapted to remain fixed or set after adjustment so as to permit separation of the members without disturbance or unfastening of said connections.

757,094. CEMENT-MOLDING APPARATUS.—Robert B. Coltrin, Jackson, Mich. In a molding apparatus, opposite supports, side members held at their opposite ends by said supports, and end members interposed between said side members and held in

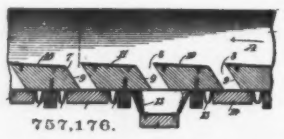
place by abutment against said supports, said side members being separable from each other to break the mold.

757,097. GRINDING-MILL.—William C. Deards, William E. Copenhaver, and Dow L. Adelsperger, Springfield, Ohio, assignors to the Foos Manufacturing Company, Springfield, Ohio. In a grinding-mill, the combination, with a base-plate having a marginal flange which forms an oil-receptacle, of a master-wheel located in said receptacle and provided with internal teeth, an outer grinding-ring mounted on and rotating with said master-wheel, pinions mounted on the base-plate within the receptacle and meshing with the master-wheel, a central gear located in the receptacle and meshing with the pinions, and an inner grinding-ring connected and rotating with said central gear.

757,134. COKE-OVEN-DOOR HOIST.—Clyde S. Mason, Buffalo, N. Y. In mechanism for handling doors of coke-ovens, furnaces and the like, the combination of a carriage arranged to move on ways above the oven or furnace, a chain or cable for engaging the door, a winding-drum on said carriage on which said chain is wound, and mechanism on said carriage operated from said winding-drum and adapted to engage said chain and deflect the same to move the door outwardly.

757,173. DREDGE.—Albert Boschke, San Francisco, Cal. In a dredge, the combination of a wheel, dredging-buckets secured on the periphery thereof, said wheel having an annular plate, a pair of friction-rollers engaging the sides of said plate, shafts carrying said rollers, bearings for said shafts, a transverse slideway for said bearings, and means for exerting a yielding pressure toward each other upon said bearings.

757,176. CONCENTRATING SLUICE-BOX.—Charles M. Carter, Sultan, Wash. A sluice-box having a series of bottomless riffles in its lower portion, a series of pliable chutes spanning the open lower sides of the riffles and adapted to be lowered to inclined positions, and false-bottom members attached individualy to the pliable chutes and arranged to span the lower open sides of said riffles and thereby close the latter.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757,189. MINER'S LAMP.—Joshua A. Hadley, Brazil, Ind., and Edward B. Putnam, Carbondale, Ill. In a lamp, the combination of a receptacle having a raised bottom member, a wick-tube connected to said receptacle, a heater adjustably mounted on said wick-tube and adapted to extend into the wick-flame, and means arranged between said raised bottom member and said heater.

757,197. COMBINATION-DIE FOR FORGING-MACHINES.—Harry Jeffrey, Allegheny, Pa. A multiple die for forging-machines comprising a die-block constructed on a side thereof, with a centrally-raised die portion leaving marginal surfaces extending outwardly from the die portion and providing grooves at the edges thereof in advance of which the hammer is adapted to operate.

757,205. GOLD-SEPARATOR.—John W. Korfhage, Denver, Colo.—A gold-separator comprising an annular trough, a rotary shaft on which said trough is mounted, a riffle-plate extended upward from the outer wall of the trough and curved inward, a screen arranged horizontally in the separator and having an imperforate portion extended partly across the trough, and mercury-containers communicating with said trough or trap.

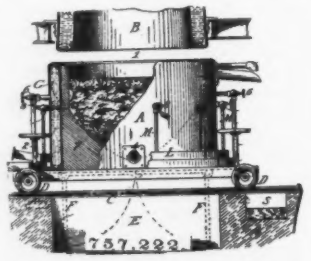
757,208. INGOT-MOLD.—Charles A. Leibman, New York, N. Y., assignor to E. P. Reichhelm & Company, New York, N. Y. An ingot-mold comprising a base, a two-part matrix; one member being fixed to said base and the other member slidably adjustable thereon, a post upon said base and adjustable means movable laterally on the post for clamping the movable member of the matrix so that in any position the pressure on both edges of the matrix is the same, making both joints equaly tight.

757,211. ELEVATING AND LOWERING DEVICE FOR BLAST-FURNACE BELLS.—William I. Mann, Pittsburg, Pa. A device for elevating and lowering blast-furnace bells comprising a flexible member adapted to be connected directly to the bell, a rocking drum, an air-cylinder, a piston operating in said cylinder and connected directly to said flexible member, a counterweight connected to the said piston, a flexible connection between said piston and said drum, and operating means for said drum.

757,220. PROCESS OF SMELTING ORES.—Allen R. Partridge, San Francisco, Cal., assignor of one-half to Frank W. Page, San Francisco, Cal. A method of smelting ores consisting in admitting air freely at atmospheric pressure to the bottom of the smelter, and producing a suction at the top of the smelter by injecting a jet of steam or air through a relatively narrow passage, causing said steam or air to pass transversely an outlet from the upper end of the smelter and to then expand to fill a relatively wider passage beyond said outlet.

757,221. SMELTING-FURNACE.—Allen R. Partridge, San Francisco, Cal., assignor of one-half to Frank W. Page, San Francisco, Cal. In a smelter, an outlet for products of combustion, a flue having one closed end and extending across and communicating with said outlet and of reduced diameter at one side of said outlet, and an injector-pipe placed at said closed end in the reduced part thereof, and discharging in said contracted part between the closed end and the outlet whereby the fluid injected through said pipe will be discharged past said outlet and fill the normal area of the flue beyond the outlet.

757,222. HEARTH FOR SMELTING FURNACES.—Allen R. Partridge, San Francisco, Cal., assignor of one-half to Frank W. Page, San Francisco, Cal. In a hearth or crucible for a smelter, a double wall or casing for the same forming a water-space, extending continuously and entirely around the hearth, a water supply pipe and a number of water-inlet pipes to said space, all in communication with said water-space.


757,222.

757,252. MAGNESIA CEMENT COMPOSITION.—Ernst Bidtel, Milwaukee, Wis. A new composition of matter consisting of a substance containing magnesia, in combination with magnesium sulphate and barium chloride.

757,276. PROCESS OF CONVERTING CRUDE IRON INTO MALLEABLE IRON OR STEEL.—John J. Deemer, Chester, Pa. In the conversion of molten crude or cast iron into malleable iron or steel, subjecting the bath of molten metal to the action of oxidizing-blasts directed over the surface area of the bath by means of an annular series of jets extending upwardly and obliquely and converging at a common point centrally above the bath-surface.

757,283. COKE-PULLER.—Andrew J. Doss, Switchback, W. Va., assigner to James Ellwood Jones, Switchback, W. Va. A coke-puller comprising an underworking wedge-like hollow scraper movable over the bottom of a coke-oven and provided with a slot or opening, an adjustable coke-holder disposed within said hollow scraper and projecting through said slot, and means for thrusting said coke-holder into operative position to hold coke on the outstroke.

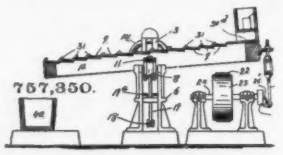
757,284. LOADING-MACHINE.—Andrew J. Doss, Switchback, W. Va., assignor to James Ellwood Jones, Switchback, W. Va. The combination of a traveling runway, a traveling shovel movable over said runway, and having a forward thrust beyond it, means for reciprocating said shovel on said runway and thrusting its front end beyond said runway into a mass of material to be moved, and means for engaging the material in said shovel for discharging it.

757,312. COKE-PULLER.—James E. Jones, Switchback, W. Va. A coke-puller comprising an underworking wedge-like scraper movable over the bottom of a coke-oven, an adjustable coke-holder hinged to said scraper and provided with a crank-arm, a lever engaging said crank-arm, and an actuating-rod connected with said lever for swinging said coke-holder into operative position.

757,318. APPARATUS FOR SETTING DIAMONDS FOR INDUSTRIAL PURPOSES.—Frederich Krause, Hoboken, N. J. A base having a slit or flat opening or perforation and a mantle or wrapping having a flat tail adapted to be passed through and bent at the slit to hold a diamond in position during casting.

757,339. METAL-TONGS.—Jesse R. Oakley, Braddock, Pa. Tongs comprising an upper support, a lower support having swinging jaws with projecting lever-arms, and flexible connections on the upper support arranged to engage either the lever-arms or the jaws.

757,350. CONCENTRATOR.—John Ruedy, Denver, Colo. A concentrating-table composed of a number of longitudinal pans widest at the center of the table and diminishing in width toward the opposite edges thereof arranged to have a transverse intermittent discharge from one to the other, the discharge being completely interrupted during the rocking stroke of the table in one direction, the said pans or shelves being provided with riffles projecting above their discharge edge and shaped to hold the concentrates on the pan, and means for simultaneously imparting to the table a longitudinal reciprocation and a rocking or oscillating movement.


757,350.

757,386. METHOD OF REDUCING METAL BARS INTO SHEETS.—Thomas V. Allis, Bridgeport, Conn. A method of reducing metal bars into sheets in pile in a heated state, which consists in first reducing hot bars to plates by passing the bars between roughing-rolls; second, collecting while hot the plates thus produced one upon another in pile within a heating-furnace and finally transferring and subjecting such pile so heated and while hot to the action of rolls to reduce the plates therein to sheets.

757,387. STILL FOR CRUDE BITUMINOUS MATERIAL.—Horace W. Ash, Cambridge, Mass., assignor to Warren Brothers Company, Charleston, W. Va. The combination of a still for distilling crude bituminous material, a compartment at the exterior of the still, a furnace so located as to heat the exterior of the still, the interior of the furnace being in communication with the aforesaid compartment, the compartment being in communication with the interior of the still, whereby the products of combustion may pass from the furnace to the compartment and there heat the exterior of the still, and then pass on and be injected into the interior of the still.

757,410. COMBINED ENGINE AND COMPRESSOR.—Sidney A. Reeve, Worcester, Mass., assignor to Charles F. Brown, trustee, Reading, Mass. A combined steam-engine and compressor comprising two engine-cylinders having non-synchronous pistons, a crank, a rigid reciprocating member connecting the two pistons with the crank, and an elastic-fluid-compressor cylinder whose piston receives motion from said reciprocating member, and is timed to reach dead-point slightly ahead of the later of the two engine-pistons.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending March 26, 1904.

9,464 of 1903. MINE CAR.—J. Shaw, Wakefield. Improved construction of colliery tubs made of steel specially with regard to the buffers and couplers.

9,689 of 1903. CRUCIBLE FURNACE.—J. Baxeres de Alzugaray, London. Improved form of crucible furnace, the chambers being arranged to give a specially high degree of heat.

11,495 and 11,805 of 1903. Dump Car.—J. Shaw, Pontefract. Improved form of bottom discharge wagons for coal, ore, etc.

23,918 of 1903. TREATING ALUMINUM SULPHATE.—L. R. Keogh and B. Broughton, Hamilton, Ontario. Apparatus and process for treating a mixture of sulphate of alumina and common salt with steam, thus producing alumina, sulphate of soda and hydrochloric acid.

1,842 of 1904. HARDENING STEEL.—E. Engels, Dusseldorf, Germany. Improvements in inventor's hardening process for steel, by surface treatment with carbides and subsequent rolling or pressing.

SPECIAL CORRESPONDENCE.

Denver. April 16.

(From Our Special Correspondent.)

The labor situation in the leading coal and precious metal mining districts of this State continues the leading topic. Apparently matters have not improved much during the week, although the troops have been withdrawn from the Cripple Creek district, where the strike now seems to be virtually over. At Telluride, the attempted return of a large number of deported agitators was stopped by the militia, the officer in command ignoring an injunction of the judge of the District Court; when the same judge issued an order for the arrest of Gen. Sherman Bell and Capt. Bulkley Wells, on account of their refusal to bring President Moyer to his court, they refused to allow the sheriff of Ouray county to do more than read the papers to them. In consequence, it is expected that the Supreme Court will shortly have to pass upon the question of authority between the civil and the military authorities. It is understood that papers are being prepared to test the matter.

The Supreme Court has issued a writ of habeas corpus against the commander of the militia at Telluride ordering him to produce C. W. Moyer in Denver on April 21. There is no doubt but that the order will be obeyed, and the disputed points settled before long.

The situation in the southern coalfields is improving and the different coal companies are gradually securing the necessary miners. The daily output of coke in Las Animas county, which is still under martial law, is now about 1,500 tons, or about half of the full capacity. One day last week the Colorado & Southern Railroad hauled out 175 cars, containing over 8,000 tons for the North, while three trains were sent south, beside 1,000 delivered tons to the Santa Fé Railroad at Trinidad. The Colorado Fuel & Iron Co., which for some time past has only worked its large Pueblo plant on a very limited scale, is gradually increasing operations. The management, at the beginning of the winter, feared a coal famine on account of the strike, and rather than to have the people all over the State suffer from this, furnished the public with fuel at a moderate price from its mines and curtailed its operations at Bessemer, thereby preventing much inconvenience, and even suffering.

It seems probable that the American Mining Congress will soon establish its headquarters in Denver, the Denver Chamber of Commerce and Board of Trade of this city having invited the executive officers of the Congress to do this.

At a meeting of the science branch of the Colorado State Teachers' Association at the Golden School of Mines, these papers were read: 'The Geology of the Colorado Springs Quadrangle,' by Dr. Finley, of Colorado College; 'A Solution of Kepler's Problem,' by Dr. Howell, of the Denver University; 'Radium and Radio-Activity,' by Dr. H. C. Fleck, of the School of Mines, and 'Poisonous Gases of Death Gulch, Yellowstone Park,' by Dr. F. W. Traphagen, of the School of Mines. A few days ago a party of prominent mining men, including Mr. John Hays Hammond and Professor Munroe, of Columbia University, visited the school. The latter is director of the proposed joint summer school in mining, to be conducted in Colorado by the mining school of this State, Harvard, Columbia and the Boston Institute of Technology. It is said that these gentlemen made arrangements at Idaho Springs for practical operations by the students, this summer, at one of the mines, and an offer from one of the leading Cripple Creek mines is also under consideration.

A bill has passed the United States Senate providing that, where patents have issued for mineral lands, those lands only shall be covered which are bounded by lines, actually marked by the monuments of the official survey, and these monuments will constitute the highest authority to which errors in the patent description shall have to give way.

Pittsburg. April 17.

(From Our Special Correspondent.)

The inquest in the Harwick mine disaster of January 25, which cost the lives of 178 men and boys, came to a sensational close on April 16. Mine Inspector F. W. Cunningham, of the fourteenth district, and Superintendent Wilfred Sowden, of the Allegheny Coal Co., operating the Harwick mine, are held by the verdict of the coroner's jury to await the action of the grand jury on a charge of murder. Warrants were issued for their arrest. When the inquest opened on March 29 James E. Roderick, of Harrisburg, chief of the State Bureau of Mines, expressed displeasure over certain rulings of the coroner. Later he declared that the officers of the mine bureau were not receiving fair treatment and the responsibility of the accident would not be placed on any of the dead men. Before the inquest was concluded Mr. Roderick made a statement in which he said he had consulted some of the officials of the State Department and decided to request Governor Pennypacker to appoint a commission of five of the best men in the State to investigate the cause of the explosion. He said his purpose is to enlighten the public and give the information in an intelligent manner.

The jury, after deliberating for five hours, returned a verdict finding that the explosion was caused by a blow-out shot, igniting gas and coal dust; that the ventilation was insufficient, due to accumulation of ice at the bottom of the air shaft; that it is the duty of mine foremen to have ice removed and air shaft in proper condition; that Mine Foreman Brown and Fire Boss Gordon did not comply with the mining law of Pennsylvania; that Superintendent Sowden violated the State Mining law in not signing mine foreman and fire boss' report books; that Mine Inspector Cunningham violated the mining law by not enforcing its requirements, by not having an indicator placed on the fan and for allowing longer time to elapse than the law requires in making his official inspection, not considering his visit in November an official inspection. It found that Inspector Cunningham and Superintendent Sowden should be held for the action of the grand jury on the charge of murder, censured the Allegheny Coal Co. for not attending to the mine according to law, and recommended that the legislature enact mining laws that are more specific. Coroner McGeary's charge to the jury was voluminous, covering the testimony of the many witnesses, the duties of the mine officials and the mine inspectors. The charge in part was: "Fire Boss Gordon examined each working place daily. Almost every day he found gas in various places, and, according to the mine foreman's book, Mr. Brown removed all dangers reported. The mine foreman's book shows the mine to be in a safe and healthy condition up to and including January 23, 1904, the date of the last record. Mine Inspector F. W. Cunningham on November 4 examined the mine, but did not use an anemometer, nor borrow the company's, neither did he visit every entry or heading as required by law or post his notice of any examination or send a report similar to the other reports he had sent to his department at Harrisburg. He tested the ventilation by blowing his breath in the air. So far as the law requires you have no knowledge of any examination of that mine after October 7, nor was there one.

T. M. Jones testified that on the morning of January 23 there was much ice in the overcast near the foot of the air shaft.

On the evening of January 24 the ventilation must have been poor, as Thomas Woods testified that Fire Boss Gordon told him not to turn the compressed air off in one room. The operator and superintendent were not providing ample means of ventilation to dilute and carry off the noxious gasses. Some time between 4 and 4:30 a. m. on January 25 Fire Boss Gordon went down to examine the mine. He came out about 7 a. m. and reported all right. The miners who had been waiting for him to come up were lowered down the shaft.

The machines may have been all at work producing much dust in the atmosphere as has been testified, when suddenly the explosion took place at about 8:15 a. m., killing everybody in the mine except one man. The testimony shows that if the law had been carried out the explosion would not have occurred. The law in regard to dust is not specific enough, but it is evidently the duty of the operator or those in his employ to keep it from accumulating to a dangerous extent.

The mine foreman was evidently careless to a criminal extent in allowing ice to remain in the airway to hinder ventilation. The superintendent was equally bad in not keeping in touch with the conditions as they existed in that mine for at least two or three weeks before the explosion. The operator did not provide ample means to ventilate the mine when the area of the intake was almost closed with ice.

If the inspector had examined the Harwick mine as required by law within the three months from the time he did examine it legally on October 7, he would have found all the dangerous conditions that contributed to make the explosion possible, and is evidently guilty of wrong-doing, by neglecting his duty."

Chief Mine Inspector Roderick has since made this statement:

"Inspector Cunningham, who was appointed January 24, 1903, has undoubtedly done his State good service. He has made a special effort to comply with the provisions of the laws. He inspected the ill-fated mine in March, 1903, the latter part of April, again about the middle of July and on October 7. On November 4, 1903, he made a special inspection. At all of these inspections he pronounced the mine in good condition.

I attended most of the session of the inquest, and there was no evidence adduced at any time whereby Inspector Cunningham could be censured. At the early part of the inquest I found that Coroner McGeary and his assistant were making an effort to bring evidence to fasten the guilt on Mine Inspector Cunningham. The latter has in his possession sworn statements from a reliable person that one of the deputy coroners had been making a special effort to get some proof against Cunningham for neglect of duty. In my opinion the verdict is unjust and not in accordance with the evidence."

San Francisco. April 13.

(From Our Special Correspondent.)

A decision by the Superior Court this week against John Hays Hammond and associates settled the question of control of the Oroville Gold Dredging & Exploration Co. The plaintiffs were John Hays Hammond, C. H. McCormick, A. L. Ryerson, A. Cass Canfield, A. Chester Beatty, J. E. Doolittle, E. A. Wiltsee, J. L. Houghteling and F. B. Peabody. The defendants were F. W. Bradley, president of the company; W. R. Berry, Edwin Schwab, W. C. Webb, A. Granger and W. H. Crocker, and Luther J. Holton and J. W. Goodwin. The complaint charged that Bradley had mismanaged the property, that he and Crocker had orally denounced the company's property as worthless, and then held what purported to be a directors' meeting, at which authority was given to sell 40,000 shares of stock standing in the corporation's name. Of this stock Bradley bought 20,000 shares and Goodwin and Holton each 10,000 shares at a price alleged to be below the actual value. It was claimed that before Goodwin and Holton were allowed to purchase, the stockholders, particularly the plaintiffs, should have been allowed to buy. The plaintiffs tried to prevent the voting of this stock, but failed. The 40,000 shares having been sold to defendants Bradley, Holton and Goodwin, by Bradley himself, and the sale having subsequently been ratified by the board, it was urged: (1) That the issue of this stock was void in that it was made to certain persons selected by Bradley or the directors without such shares having been first offered to the existing stockholders in proportion to holdings; (2) that the purpose of the issue was to enable the directors and their friends to obtain control at the coming election and deprive the majority of the stockholders from control otherwise belonging to them; (3) that in any event the sale of 20,000 shares to Bradley himself was invalid, he being a director (and trustee) and as such disqualified from dealing with trust property in his individual capacity. The alleged ratification of sale by directors was claimed to be ineffectual.

The company was organized with a nominal capital of 500,000 shares of a par value of $1 each. On February 3, 1904, the day before the issue of the 40,000 shares in question, there were issued and outstanding 367,251 shares. There is no provision in the laws of Arizona (under which the company is incorporated), or in the by-laws of the corporation touching the right of the stockholders to share in subsequent

issues of stock. The rule is well established that "those who are shareholders when an increase of capital stock is effected enjoy the right to subscribe to new stock in proportion to their original holdings, and before subscriptions may be received from outsiders." The contention of the defendants was that this right of pre-emption, so-called, applied only where there has been an increase of stock beyond the amount originally authorized by the articles of incorporation, and the contention of the plaintiffs was that it applies to all issues of stock not theretofore issued, whether a part of the originally authorized capital (as here) or not. The plaintiffs argued that the right of pre-emption, to whatever extent it may exist, rests on the ground that the ownership of shares carries with it not only the right to receive dividends, but also a voice in the election of directors and in the control, that the extent of the influence of the stockholder depends on the proportion his stock bears to the total issued, and that he has a right to preserve that proportional influence if he sees fit; or, in other words, that the directors should not, by an issue of new stock, be permitted to disturb the relative influence of the stockholders without their consent.

Judge Sloss, while admitting the correctness of this reasoning in the case of an increase of capital stock on an incorporation beyond the amount originally authorized, did not think it applicable to a portion of the originally authorized capital which may remain unissued. Indeed, he thinks a stockholder may insist that all of the authorized capital shall be subscribed before he can be called on to pay for his stock. The taking of remaining stock by others is an implied condition upon which the subscription shall become binding. He may waive this condition and take his stock before the rest has been sold; but by waiving it he does not acquire a new right entirely inconsistent with it, namely, the right to have a definite proportion of the remaining stock issued to him. In this case, whether or not the stockholders had authorized the sale of all or any of the stock remaining unissued becomes immaterial in view of the conclusion reached as to right of pre-emption.

It appears that the corporation was organized in 1901 to acquire and work dredging land near Oroville. Plaintiffs Doolittle and Wiltsee held options on these lands and turned them over to the company, getting 67,200 shares of stock therefor. From then until January, 1903, there were issued various blocks of stock principally to Hammond and Crocker, the additional shares being 210,001, making total outstanding stock in January, 1903, 277,251 shares, for all of which except the stock of Doolittle and Wiltsee the company received the par value of $1 per share. The money realized paid for the lands and a dredge. In March, 1901, the directors had ratified a sale of 100,000 additional shares to a syndicate of Chicago men, the stock to be issued when balance of purchase price was paid. Not until January, 1904, did Houghteling, one of the Chicago men, pay the balance on his stock for 20,000 shares. At intervals between that date and February 3, 1904, other members of the syndicate paid for their stock; on February 3, 90,000 of the 100,000 shares had been taken up by the Chicago men. On February 4 the board of directors at a meeting not regularly called authorized the sale of 19,000 shares to Bradley and 19,000 shares to Goodwin and Holton. The meeting was adjourned to next day, when the president and secretary issued 20,000 shares to Bradley and 10,000 shares each to Goodwin and Holton at the par value.

Since March, 1901, Bradley had been president and manager. The operations had not been profitable, and there was considerable criticism of Bradley's management, mainly from Hammond. The plaintiffs contended that a reasonable inference from Bradley and the other directors hastily issuing 40,000 shares was to create a majority and obtain control.

The judge says that the facts recited go far to justify this conclusion, but their effect is modified by further facts and circumstances. The dredge installed in 1901 when Bradley assumed control has been operating ever since. Its efficiency has been a disputed point between Bradley and Hammond, and the old dredge is not now the most economical machine obtainable. It is essential that a new dredge, to cost $70,000, be provided, but the company has never had money sufficient to pay for this. When the sale of the disputed 40,000 shares took place there was in the treasury $33,000, and the sale brought $40,000 more, so purchase of a dredge was authorized on February 8, 1904, before this suit was begun. The defendants aver that in view of certain negotiations with Houghteling and Hammond, Goodwin, Houghteling and Bradley bought the stock referred to. The design of Goodwin to obtain control had been well known to many stockholders. As far as the question of motive is concerned, the Judge did not think the plaintiff's case sufficiently clear to warrant granting an injunction. The evidence before the court did not support the allegation that the directors other than Bradley were mere tools or dummies, nor does it appear they had such an interest in the transactions to disqualify them from voting The Judge denied the injunction asked to restrain Bradley and associates from voting the 40,000 shares of stock.

The secretary of the California Petroleum Miners' Association estimates that the yield of oil in California in 1903 was 23,602,000 barrels, of which 15,750,000 barrels came from the Kern River field. This year, however, the Standard Oil Co. is not taking all the oil that field produces, alleging lack of storage capacity, and producers are apt to accept low prices to make sales. At the Coalinga field in Fresno county about 15,000 barrels a day are shipped, the Standard company taking all the output, as the oil is lighter and sells readily. The Santa Maria oil district, in Santa Barbara county, continues to attract attention. The area now covered by actual work is about 350 square miles. The Union Co. alone has 180,000 acres. Some wells are yielding well and many others are being sunk.

Three large sales of gold-dredging ground have been recorded within a few days, one tract being in Butte county, one in Siskiyou and another in Yuba. Conditions are quite different in each locality, yet the same price per acre was paid, viz., $800. This seems about the average price for ordinary dredging ground, which is usually proven by drilling before work begins. For exceptionally rich ground higher prices have been paid. The report that the Pacific Steel Co., of San Diego, had purchased for $650,000 the coal lands of John H. Scott, near Tacoma, is denied by Mr. Scott.

Owing to the death of Henry F. Bulwer, the suit he instituted against the Yukon Crude Oil Co. has been dismissed by stipulation in the United States Circuit Court. The action was one in equity to declare void and illegal the consolidation of the Yukon Crude Oil Co. with the Rex Co. and the American Fuel Oil Co., under the name of the Union Consolidated Crude Oil Co. Prominent men were made defendants in the case.

Toronto. April 7.

(*From Our Special Correspondent.*)

The Canadian Copper Co., of Copper Cliff, Ont., has shipped to St. Louis a lot of nickel ore, matte and refined nickel to be erected at the Exposition in the form of a pyramid some 25 ft. high.

The lands along the route of the Temiskaming & Northern Ontario Railway, in New Ontario, containing the newly discovered deposits of cobalt-nickel arsenide and silver ore, which were withdrawn from prospectors on November 11, have again been thrown open by an order in Council adopted on April 6, not by the Provincial government. It is provided that mining locations within that belt are limited to 40 acres each and no applicant can locate more than three such claims in any one year.

The Dominion government has disallowed the Coal Mines Regulation act passed in 1903 by the British Columbia legislature preventing Chinese and Japanese from being employed in underground work in any mine.

F. S. Wiley, of Port Arthur, Ont., has forwarded a diamond drill to his hematite iron deposit on Black Spurgeon lake, south of Lake Nepigon, and will begin drilling immediately.

The commissioners, Dr. Haanel, F. Cote, W. Neilstrom and C. E. Brown, returned to Ottawa on April 17. They visited Sweden, Germany and France. The most important results were obtained from their inspection of the works of Keller, Leleux & Co., at Livet, some 21 miles from Grenoble, France. Here they found four electric furnaces in operation day and night on rush orders for ferro-chrome, ferro-silicon and ferro-tungsten. The commissioners for three weeks witnessed the process of reducing iron by electricity. Dr. Haanel has intimated that the result was most successful. Prof. Harbord, of England, accompanied the party. According to his statements the cost of producing pig iron by the Livet process is not over $8 per ton.

New regulations have been issued by the Canadian Government regarding oil lands in Manitoba, the Northwest Territories and the Yukon. All unappropriated Government lands are thrown open to prospectors, but it is provided that an area of 1,920 acres may be reserved to any individual or company, having machinery on the land to be prospected. In case of the discovery of oil in paying quantities on Crown lands, such discovery being established to the satisfaction of the Minister of the Interior, an area not exceeding 640 acres, including the oil well, will be sold to the discoverer at $1 per acre and the remainder of the reserved area of 1,920 acres will be sold at $3 per acre. The patent will convey the surface of the land and the petroleum, but other minerals will be reserved.

The Leamington Oil Co. has struck another gusher about 1¼ miles from Leamington, Ont., at a depth of 1,044 ft. This well is the fourth struck by the company and is probably the most valuable. The oil was accompanied by a strong flow of gas.

The United Coal Fields, Ltd., of British Columbia, is petitioning the Dominion Parliament for permission to sell, lease to or amalgamate with the West Canadian Collieries, Ltd., a company having a British charter, capitalized at £1,000,000. The former company also wants an extension of the terms fixed for commencing and completing its railroad to two and five years, respectively.

Victoria. April 12.

(*From Our Special Correspondent.*)

The Howe Sound Mining Co. is to take over the Britannia mines, the shareholders in the original syndicate accepting new stock to the value of $2,500 for each share of the 400 shares so held. The new company is capitalized at $2,000,000 and proposes to develop the mine on a large scale.

The last report of the Cariboo Consolidated's La Fontaine mine states that dry, compact gravel has been struck in the tunnel which has now been driven a distance of nearly 300 ft.

L. C. Park, of Vancouver, is installing an experimental plant to save the gold values in the tailings from the Oyster-Criterion mill in the Lardeau. The machinery is now being hauled into camp. The tailings run from 80c. to $1 per ton.

Both the Nelson and Rossland boards of trade have signified approval of the memorial recently addressed by the associated silver-lead mines to the Dominion Government asking that the Canadian lead smelters be permitted to export under the benefits of the lead bounty act, from April 1, 1904, to June 30, 1905, a certain tonnage of low grade concentrates not to exceed 14,000 tons annually—which cannot be economically treated at present in the country—and furthermore asking that the producers of this ore be accorded the full benefit of the bounty, provided "a sufficient amount remains available after the producers of lead ores, both mined and smelted, in Canada have received the bounty to which they are now entitled, at the full rate of $15 per ton; otherwise at such reduced rate per ton as will absorb the unearned balance."

On the Rambler-Cariboo near McGuigan, the main lead is reported cut in the 800-ft. level, with values averaging 67% lead and 137 oz. silver.

Mr. Hooper, who recently reported on the Ymir mine, states that there may be approximately 45,000 tons of ore blocked out, which by the proposed new method of mining should yield a net profit of $7.75. The last monthly report from the manager showed a small profit of $450.

Last week some good ore was struck from the raise in the tunnel of the Atlin mine, while a strike in the tunnel at a vertical depth of 240 ft. in the Wilcox in the same district, shows average assay values of $75 per ton. It is reported that a 100-ton concentration plant is to be erected at the Alice mine, near Creston. The

Highland mine at Ainsworth is steadily worked under lease, producing about 300 tons of concentrates monthly.

Mr. Couldrey, manager of the Elmore mill at the Le Roi No. 2, at Rossland, is reported to have said that the plant is making a fair profit by the treatment of the mines' second grade ores by oil concentration.

The British Columbia Copper Co. has commenced development work on the Bruce claim near Midway, which it holds under bond. Work is to be resumed at the Carnic mine on the west fork of Kettle river.

London. April 9.

(From Our Special Correspondent.)

The report of the Great Fingall Consolidated for 1903, which has just been issued, contains a great deal of matter of interest to mining men, especially in connection with the reduction of costs. Very complete analyses of the costs of the various departments are given, so that their gradual reduction month by month can be readily seen. During the year 98,200 long tons of ore were mined and treated, producing 130,875 oz. fine gold, and the total expenditure in Western Australia during that period was £137,481. The costs of producing this gold are divided into development, ore extraction, stoping, timbering, filling, tramming, hoisting and pumping—ore reduction, and general maintenance, including small items that cannot be otherwise allocated, and bullion realization. The proportion for development is figured at 4s. 2d. a ton, while the average cost of extraction was about 11s., reduction 8s. 9d., and general realization about 4s. per ton; the total being approximately 28s. a ton. This is the average over the year, but a study of the monthly tables shows that the total cost per ton was reduced from 31s. 4d. in January to 22s. 8d. in December. Since the beginning of the present year further economies have been made, but exact figures are not yet available. During 1903 the chief reduction was in ore extraction, where the monthly costs were reduced from 12s. 6d. in January to 7s. 7d. in December. During the present year the cost per ton for development will come out lower, and, as an additional reduction plant is being erected, the cost of reduction will also be lower. The information given as to ore reserves is also interesting. The reserves are divided into "ore blocked out, on three or more sides," which is estimated at 252,000 tons, averaging 28.9 dwts. of gold, and "ore in sight," which is placed at 148,000 tons, averaging 20 dwts. per ton, the total amounting to about 400,000 tons. Another point worthy of notice is that the whole of the cost of the new reduction plant is being defrayed out of revenue, a sum of £145,000 being written off for this purpose, while £64,000 is being devoted to mine development and £26,000 to depreciation of plant. Dividends to the amount of £200,000 have already been paid out of the year's profits, and a further dividend of £75,000 is now declared. On a nominal capital of £125,000 this distribution is an excellent performance.

The tendency nowadays is to have mining shares of as low a denomination as possible, so as to encourage brokers to make a market. With £5 shares standing at £50 and the prices cut fine, there is little profit in a large turnover. A freer market is of advantage to both broker and client. At the present time, the Arizona Copper Co. is contemplating the splitting of their £1 shares into four of 5s. each. The shares are not much seen on the London market, but are important investments in Scotland, and their price is about £8. This company has often rearranged its capital in the early days because of its many vicissitudes. The reason for making the present rearrangement is a much pleasanter one.

The Sierra Buttes Gold Mining Co., operating in California, continues to work the mine of that name, and also the Plumas Eureka, but does not make sufficient profit to enable it to pay a dividend. During the last half of 1903, ore to the amount of 8,407 tons was milled, yielding gold valued at $27,448, the average yield being $3.25 per ton. As the net profits amounted to only $3,000, the balance is carried forward. For some years the directors have been desirous of disposing of the property, and at the present time negotiations are pending which will probably be concluded shortly. These mines are low grade, characteristic of the district, and in private ownership would yield a profit. Such properties, however, are quite unsuited to ownership by a joint stock company, having its head office here. A sale could be easily effected locally to people who would do the whole of the work, but the company has been asking far too high prices.

Perth. March 14.

(From Our Special Correspondent.)

The February gold yield of 194,320 oz. from Western Australia was rather disappointing after the previous months, but is better than February of last year. A short month and absence of many miners during the worst heat of the season, no doubt accounts for some falling off.

A trial run has been made of a new induction draught furnace by Mr. Head, of Greenbushe, who has been treating tin for two years very successfully. The Government purposes to purchase three such furnaces for use on the Phillips river copper field. The furnace is of the ordinary waterjacket type. The waterjacket shaft is suspended on two iron girders. Instead of blowers a steam jet is employed to induce the draught to flow into the annular opening between the waterjacket shaft and the crucible top. There are no tuyeres, the circular opening replacing them. The furnace is said to be suitable for nearly every kind of ore or mineral.

Kalgoorlie.—The Golden Horseshoe is being added to the long list of companies in the hands of Messrs. Bewick, Moreing & Co. In the Varinga recently taken over by that firm, a find of rich telluride 19 in. wide at the 200 ft. level is announced. Nothing of value had previously been discovered in the mine. Another good find is reported in the Associated, where a cross lode near the boundary of Lake View Consols ground, cut by a bore hole from the 10th level gives assays averaging 15 dwts. of gold per ton over a width of 27 ft. The Ivanhoe ore reserves are estimated at 513,800 tons blocked out, valued at 19 dwts. per ton, not including recent developments at the 10th (bottom) level. February returns from Oroya-Brownhill show a record profit of over £36,000, working on a milling average of 35 dwts per ton, as recently fixed. The principal yields for February are: Golden Horseshoe, 12,179 tons for 17,110 fine oz.; Great Boulder, 8,628 tons for 12,989 fine oz.; Oroya-Brownhill, 7,796 tons for 12,407 fine oz.; Ivanhoe, 14,116 tons for 10,085 fine oz.; Associated, 6,346 tons for 6,211 fine oz.; Kalgurli, 4,600 tons for 4,260 fine oz.; Lake View Consols, 8,403 tons for 4,206 fine oz.; Great Fingall Consolidated, 9,236 tons for 10,948 fine oz.; Cosmopolitan, 7,765 tons for 3,033 fine oz. The Ivanhoe has produced to date 19 tons 9.25 cwt. of fine gold.

Murchison Field.—The Rubicon, north of Great Fingall, has crushed 193 tons for 124 oz. of gold. The Great Fingall Associated, floated in Perth as a local company, has started work. Mr. Grace is manager.

Sydney. March 15.

(From Our Special Correspondent.)

At the British mines the diamond drill from the 400 ft. level is down 65 ft. It passed through two 4-ft. bands of ore at 44 ft. and entered good sulphides which continued to 65 ft. This is the same ore body as on the 300-ft. level.

The Crowl Creek copper mines for the fortnight in February produced 404 tons of ore for 90 tons matte and 34 tons copper. At the 330-ft. level the north drive is in ore, showing great improvement. The Burraya copper mine has started. At Coper Chesney mine the 500-ft. level cross-cut is on a 1 ft. vein worth 24% copper and 5 dwt. gold; and a 4-ft. vein of iron pyrites has been struck at 460 ft., and will be used in smelting.

The Wylie creek dredge has raised 28 tons tin ore for 85 hours' work, and the new Wylie worked 114 hours for 25 tons tin ore.

At Yuljilkar the mercury mine is actively worked; 61 tons of ore averaging 2½% have been raised and treated.

The Highland Mary mine at Swamp Oak, is to be reopened.

The two zinc separators at Block 14 are working full time and 300 tons of zinc concentrates have been produced. The Central mine of the Sulphide Corporation reports 4,430 tons milled for 855 tons concentrates, assaying 61.8% lead, 9.8% zinc and 30.8 oz. silver per ton; 4,200 tons milled for 830 tons concentrates, assaying 61% lead, 9.9% zinc and 30.4 oz. silver per ton.

Coal mining conditions at Newcastle are very depressed. There has been a further decrease in the export trade, and several mines are likely to close soon.

The O'Loughlin Copper Syndicate has put through 200 tons crude ore for 20% copper.

The Ovens Valley Sluicing Co. has, since August 10, 1903, worked 100 days, treated 119,850 cu. yds. for 650 oz. gold, or 41 oz. per week.

Bendigo & Eaglehawk gold purchases for February amounted to 19,238 oz., the highest February returns since 1885.

Britannia United, Ballarat, obtained 227.5 oz. gold for 10 days' work.

The Pioneer Tin Co. has sluiced 157,900 cu. yds, of dirt (Bradshaw's creek) for 192 tons 14 cwt. of stream tin during the last half year. The yield for the first 7 seven weeks of 1904 was 37.5 tons of stream tin.

The. Mt. Morgan mine, during February, treated 17,097 tons and cleaned up 9,737 oz. of gold.

Victorian dredging, in some cases, is giving satisfactory results. At Campbell's creek, Castlemaine, 7 weeks' work yielded 268 oz. gold, and O'Keefe's Hydraulic Sluicing Co. has had a clean-up for 300 oz.

Broken Hill.—The Port Pirie smelter's output for February was: Silver, 400,361 oz.; lead, 4,289 tons, and antimonial lead, 26 tons. The South mine has produced in the last two weeks 601 tons concentrates containing 68% lead, 8% zinc and 25 oz. silver per ton; 686 tons concentrates containing 70% lead, 7% zinc and 27 oz. silver per ton, and shipped 760 tons concentrates to South Australia.

Charters Towers.—The February returns of Charters Towers were: 18,400 tons crushed for 20,450 oz. gold, 17,800 tons cyanided for 9,900 oz. gold and £43,500 paid in dividends. Brilliant & Central, 1,525 tons for 1,235 oz. gold; Queen's Cross Reef, 2,650 tons for 9,200 oz. gold; North Smithfield, 440 tons for 634 oz. gold.

Croydon.—Returns for January are: Ore crushed, 3,262 tons for 4,208 oz.; ore cyanided, 800 tons for 465 oz.

Gympie.—February crushings were 18,851 tons for 13,975 oz. gold.

New South Wales.—The gold yield for February was 25,934 oz. fine, valued at £110,189, as compared with 10,592 oz. in January.

Queensland.—The gold yield for February was 50,775 oz. fine, a decrease from January.

South Australia.—The Wallaroo Smelting Works, for the first six weeks of 1904, smelted 4,646 tons yielding: Copper, 604 tons; silver, 1,830 oz.; gold, 329 oz.; sulphuric acid, 436 tons.

Tasmania.—The mineral output for February was valued at £79,500 ($397,500), a decrease of £17,000 ($85,000) over the January returns; 1,882 tons of ore were treated for 1,459 oz.

Victoria.—Owing to continued labor troubles, the Gippsland coal output for 1903 was only 63,366 tons, as compared with 217,763 tons in 1902.

Auckland. March 12.

(From Our Special Correspondent.)

The chief returns during February were: Waihi, £53,267 ($266,335) from 19,874 tons, equal to £2 13s. 7d. ($12.97) per ton; Talisman, £7,354 ($36,770) from 4,335 tons, equal to £1 13s. 11d. ($8.20) per ton—working costs, 4s. 4d. ($1.05) for mine development, 10s. ($2.43) for mining, 11s. ($2.68) for treatment, 1s. 3d. (39c.) for general expenses; total, £1 6s. 7d. ($6.45) per ton; New Zealand Crown, £3,354 ($16,770) from 2,620 tons; Komata Reefs, £2,200 ($11,000) from 1,250 tons; Tairua Broken Hills, £1,730 ($8,650) from 600 tons; Royal Oak, £1,700 ($8.500) from picked stone and general ore.

At the Thames diamond drill boring is making slow headway. The Victoria Co.'s hole is down 850 ft., but no discovery of importance has resulted.

The Goldfields Diamond Drilling Co., after some months of fruitless effort, has abandoned the Kurunui-Caledonian Co.'s hole and started a new hole near, which is now down some hundreds of feet. The Drilling Co. has also begun a hole in the ground belonging to the Thames Improvement Co., known as the Hidden Treasure claim.

Gold Dredging.—The Molyneux river has been exceptionally low, and many dredges obtained really good returns. The Electric No. 2 dredge (Cromwell) struck ground of phenomenal richness, and for four or five weeks in succession the yield was over 100 oz. per working day. During the first week of February this dredge obtained 1,265¾ oz., thus beating the previous record for a week's work of 1,234 oz., held by the Lady Ranfurly dredge (also belonging to the Electric Co..) since July, 1900. Towards the end of February heavy rains caused a flood in the Molyneux, and a partial suspension of dredging.

Hauraki Goldfield.—The Waihi mine maintains its position as one of the world's greatest gold producers, but some of the other mines are hardly holding their own, and in several cases a falling off in the returns is noted. In the Waihi district there are one or two mines (notably the Waihi Grand Junction) which promise well, but none have reached the producing stage.

New Zealand Gold and Silver Exports.—During February the colony exported 52,318 oz. of gold, valued at £202,294 ($1,011,470), and 66,442 oz. of silver, valued at £6,271 ($31,305).

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL, and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mining and metallurgical engineers are invited to keep the Engineering and Mining Journal informed of their movements and appointments.

Mr. H. A. Keller is in Arizona.

Mr. John B. Farish is at Denver.

Mr. Crawford Hill, of Denver, is visiting New York for a few days.

Mr. W. J. Stoneham has returned to Tonopah from southern Nevada.

Mr. C. A. Molson, of Salt Lake City, sailed by the *Cedric* on April 20.

Mr. Edwin C. Homersham has returned to London from West Africa.

Mr. Leonard H. Retallack has returned to Cornwall from West Africa.

Mr. A. B. Frenzel has reached Denver, and will leave shortly for St. Louis.

Dr. Edgar Samson has left New York to undertake professional work in Chicago.

Mr. Henry Carmichael, of Boston, Mass., was at Salt Lake City, Utah, recently.

Mr. E. J. Schmitz, of New York, is examining copper mines in southwest Virginia.

Mr. Auguste Mathez has left New York to examine mines in Lincoln county, Nevada.

Mr. Philip Newitt is manager of the Lexington Hill Gold Mining Co., Lexington, S. D.

Mr. Walter B. Devereux is now a director of the Greene Consolidated Copper Company.

Mr. G. Percy Ashmore and Mr. Ernest P. Ashmore are examining mines in Cornwall.

Mr. R. A. F. Penrose, Jr., was in Denver recently, after a professional trip to Arizona.

Mr. C. H. Wittenoom is manager of the Central and West Boulder mines, at Kalgoorlie.

Mr. William Beals, Jr., of Boston, has returned from professional work in Costa Rica.

Mr. George J. Rockwell, of Butte, Mont., will be in New York during the current week.

Mr. Lucius J. Boyd, of Tallapoosa, Ga., sailed from Philadelphia for London on April 19.

Mr. Karl Howard now has his office at No. 330 Pine street, San Francisco, California.

Mr. John Hays Hammond has returned to New York from Mexico and Colorado.

Mr. William G. Barney is manager of the Imperial Copper Co.'s mines at Silverbell, Arizona.

Mr. J. I. Wright has been promoted to chief assayer of the Federal Mining Co., at Wallace, Idaho.

Mr. S. A. Parnall is general manager of the Calumet & Arizona Copper Co., at Bisbee, Arizona.

Mr. C. A. Ross, of London, reached New York by the *Celtic* on April 10 and proceeded to Arizona.

Mr. William Russell has left Denver for Sheridan, Mont., where he expects to remain during the summer.

Mr. Philip L. Foster has returned from El Oro, Mexico, and sailed for London on April 20 by the *Cedric*.

Mr. Alan J. Fairbairn arrived in New York by the *Campania* on April 16, on his way to Durango, Mexico.

Mr. J. H. Holmes, of Boulder, Colo., is at Clifton, Ariz., in the employ of the Arizona Copper Company.

Mr. E. W. Sebben returned to Denver last week from a professional trip to Arizona, California and Nevada.

Mr. Richard H. Terhune has opened an office as consulting mining engineer and metallurgist at Easton, Pennsylvania.

Mr. Norman A. Root is now connected with the firm of Harron, Rickard & McCone, San Francisco, California.

Mr. Alfred Skeels, manager of the Orado Gold Mining Co., has returned to Central City, Colo., from the East.

Mr. Chester W. Knox has returned to Cripple Creek, Colo., from Boston, Mass., where he spent several months.

Mr. W. Ball has resigned as superintendent of the Lower Mammoth Mining Co., at Tintic, Utah, and is at Lehi, Utah.

Mr. G. H. Robinson, of Salt Lake City, Utah, recently visited the Britannia copper mines, in British Columbia.

Mr. R. J. Grant, of Denver, is to become manager of the Cosmopolitan Proprietary on his arrival in Western Australia.

Mr. F. T. Axtell is manager of the Carribeau and Montezuma mines, at Ophir, Colo., of the Yellow Mountain Mining Company.

Mr. H. S. Munroe, professor of mining at Columbia University, after spending a short time in Colorado, has returned to New York.

Mr. Alfred Harvey is at Flat River, Mo., engaged in the erection of sampling works and making alterations in the concentrating mill.

Mr. R. M. Bird, who has been at El Oro, Mex., and recently returned from a visit to Panama, left New York for London on April 20.

Mr. D. J. McNally has had charge of the construction work of the Daly Reduction Co., at Hedley, B. C., and will proceed shortly to Nelson.

Mr. Claude Compton, of Boulder, Colo., is now assistant in the assay department of the University of Colorado School of Mines, at Boulder.

Mr. J. L. Giroux, former manager of the United Verde Copper Co., of Jerome, Ariz., has established his headquarters at Los Angeles, California.

Mr. Leonard D. Sivyer, having completed his work at the Gaylord-Globe Consolidated Mines, and other mines, at Globe, Ariz., has returned to Los Angeles, California.

Mr. Arthur Warren, who was for over six years manager of the Westinghouse Publishing Department, has become manager of publicity for the Allis-Chalmers Company.

Mr. C. C. Burger, of the staff of Mr. John Hays Hammond, is now at the New England & Clifton Copper Co., Clifton, Ariz., of which property he is consulting engineer.

Mr. Thos. G. Jones, of G. W. Lehmann & Son, has left for Cuba to make an examination of newly discovered phosphate deposits. Mr. Jones will be away about a month.

Mr. C. C. Burger and Mr. F. J. Siebert, formerly superintendent of the Tonopah Mining Co., have been appointed consulting engineers of the Bradshaw Mountain Copper Mining & Smelting Co., at Prescott, Arizona.

Mr. H. A. Shipman, formerly manager of Stratton's Independence, has been promoted from the management of the Cosmopolitan mine at Kookynie, Western Australia, to that of the Golden Horseshoe mine at Kalgoorlie.

Mr. Edw. L. Dufourcq, who for the past two and a half years has been managing the properties of the Montezuma Lead Co., in northern Mexico, has resumed consulting practice, with offices in the Produce Exchange Bdg., New York.

Messrs. Douglass H. Gordon, William C. Seddon, Samuel C. Rowland, Charles T. Westcott and R. H. Edmonds, of Baltimore, Md., directors of the Alabama Consolidated Coal & Iron Co., and Col. T. G. Bush, president of the company, recently examined the companies' properties near Birmingham.

Mr. C. A. Meissner, for the last four years mineral engineer in charge of prospecting, mining and quarrying, etc., for the Dominion Iron & Steel Co., has taken the position of assistant to the executive of the Londonderry Iron & Mining Co., Ltd., Londonderry, Nova Scotia, and the Canada Iron Furnace Co., of Montreal, with headquarters in the Canada Life building, Montreal.

INDUSTRIAL.

The Stilwell-Bierce & Smith-Vaile Co. announces that its eastern headquarters will be at 93 Liberty street, New York, after May 1.

The Elyria Engine Co. is erecting a new plant at Elyria, Ohio, to manufacture gas engines, and has been placing contracts for considerable new machinery equipment.

Messrs. Bonnevie & Lee, consulting engineers of Denver, Colo., have been appointed consulting engineers for the Lexington Hill Gold Mining Co., at Deadwood, South Dakota.

The Westinghouse Co. has the contract to supply the electric equipment for the new plant at the Cactus mine of the Newhouse Mines & Smelter Corporation in Beaver county, Utah.

The Allis-Chalmers Co. recently shipped a part of the 250-ton smelter built for the Alaska Copper Co. to Seattle, from where it will be sent to Coppermount, Alaska, by steamer.

The Sullivan Machinery Co. announces that its general offices in Chicago, after April 25, will be in the new Railway Exchange building, corner of Michigan avenue and Jackson boulevard.

The Luz de Borda Mining Co. is preparing to install an electric power plant, utilizing water power from Trigueros river, at its mines in the Maravatio district, State of Chihuahua, Mexico.

The Almoloya Mining Co., working mines at Sierra Almoloya, State of Chihuahua, Mexico, is about to construct an electric power plant near Dorado, on the Mexican Central Railroad. D. W. Shanks is general manager.

F. W. Page, general manager of the United Mexican Mining & Milling Co., of Mascota, Mex., has placed an order with the Allis-Chalmers Co., of Chicago, for a 10-stamp mill, sawmill, concentrating tables, pans, settlers, and reverberatory furnace.

The Scott Car Co., Knoxville, Tenn., is erecting a large new plant, and has changed the name to the Scott & Oliver Manufacturing Co. The new plant will be used for locomotive repairs,

and building of all kinds of mining cars and supplies. J. B. Stoughton is superintendent.

The Southern Mill, Mine & Railway Supply Co., Nashville, Tenn., was incorporated February 1, and will handle supplies for mill, mine, railway, machine shop and contractors. The president is W. H. Fickling; second vice-president, B. F. Soper, secretary and treasurer, F. J. Fuller.

The International Steam Pump Co., New York, has purchased a 10-ton locomotive crane for its new plant at Harrison, N. J. The company recently placed an order with the Niles-Bement-Pond Co. for about a dozen cranes for those shops. About 12 more cranes will be ordered.

The Seymour R. Church Co. has been incorporated at San Francisco, Cal., with offices at 307 Sansome street, to do a general brokerage business, handling pig iron, coke, fire brick, cement, fire clay, fire brick dust, crucible retorts, crucibles and foundry facings. The company is capitalized at $25,000. Seymour R. Church is president; K. C. Schmidt, vice-president, and L. F. Faure, secretary and treasurer. The old business of Mr. Church, which went into bankruptcy in January last, is now in the hands of a trustee.

The Henry R. Worthington hydraulic works at the corner of Rapelyea and Van Brunt streets, Brooklyn, are shortly to be removed to Harrison, N. J., to occupy the new $2,000,000 plant of the International Steam Pump Co., now nearly completed. The Brooklyn site consists of two city blocks, or about 4½ acres, while the Harrison plant is located on a 35-acre tract and contains 18 acres of floor space. The Worthington company is one of the oldest and largest manufacturing concerns of Brooklyn, having been founded in 1843 by Henry R. Worthington, the inventor of the duplex steam pump and other hydraulic devices. About 2,000 men are employed in the works there, and many will undoubtedly go to the new plant at Harrison, which will accommodate from 5,000 to 6,000 men. The Brooklyn works will probably be sold, the company having already disposed of its large foundries at Elizabethport, N. J.

The Mexican Mine & Smelter Supply Co. recently received an order from the Mazapil Copper Co., of Concepcion del Oro, State of Zacatecas, for a concentrating plant. La Compania Minera Restauradora of Guanecevi, State of Durango, placed an order for two large Cameron steel pumps, with necessary piping and fittings for a 100-ton cyanide plant. The Keystone Mining & Milling Co., of Tapalpa, State of Jalisco, ordered two large Wilfley concentrating tables and a set of Davis crushing rolls. The Compania Minera Conco Estrellas, of Pinos, State of Zacatecas, contracted for a Merrall stamp mill. The Eureka Mining Co., of Oaxaca, ordered complete hoisting equipment for its mines. La Blanca Mining Co., of Pachuca, ordered a big Sullivan air compressor and hoisting engine. The Reforma Mining & Smelting Co., of Guerrero, ordered a complete smelting outfit, which includes the smelter, several ore cars, engines, boilers and rails.

TRADE CATALOGUES.

W. P. Fuller & Co., of San Francisco, have issued an artistic catalogue describing the Van Meter oil concentration process, and containing also numerous extracts on this subject.

The Murray Iron Works, of Burlington, Iowa, in catalogue No. 55, has a very creditable publication, showing in an artistic manner the salient features of its Corliss engines, air compressors and high-pressure boilers.

F. Weber & Co., 1125 Chestnut St., Philadelphia, Pa., are sending out printed matter calling attention to Riefler's dotting instrument and fountain pen, in connection with their large stock of supplies for draughtsmen and engineers.

The Jeffrey Manufacturing Co., of Columbus, O., has issued circular No. 73, which is a summary of the products manufactured by the company, for mines, mills, factories, industrial and power plants. The circular contains numerous illustrations of the apparatus when in operation.

The Thew Automatic Shovel Co., of Lorain, O., in catalogue No. 4, presents a neat and artistic collection of illustrations with accompanying descriptions of its steam shovels, excavators and dredges for mines, smelters, railroad work and placer mining. A number of the shovels are constructed to swing through a complete circle.

The Weber Gas & Gasoline Engine Co., of Kansas City, Mo., in catalogue 19, describes and illustrates the operation and construction of the Weber suction charcoal gas producer, in connection with the Weber engines, giving numerous data substantiating claims for the efficiency of its particular plant. The information is supplemented with a number of tables on the heating values of different fuels.

A catalogue of automatic aerial wire rope tramways has been issued by the Hallidie-Painter Tramway Co., of San Francisco, Cal., for 1904. It deals with double rope, two bucket, single rope and one bucket systems, hoisting and conveying cableways and surface trams. The advantages, construction and operation of the different systems are well described and supplemented with numerous illustrations.

The American Forged Steel Flange Co., of Chicago, Ill., is issuing circulars giving particulars of the forged steel flanges, suitable for riveting to pipe and sheet iron work, that it is now prepared to furnish. The flanges are forged from the best soft steel. When over the end of a pipe the flange and the pipe can be punched at the same time while the rivets may be compressed by a power riveter without fear of breaking, thus insuring a perfect joint.

GENERAL MINING NEWS.

Pennsylvania Railroad Co.—Shipments of coal and coke originating on lines east of Pittsburg and Erie, for the week ending April 9, and year, are officially reported as below, in short tons:

	Week.	Since January 1.	
	April 9.	1904.	1903.
Anthracite	73,352	1,041,920	1,273,544
Bituminous	502,964	7,384,189	7,441,642
Coke	201,676	2,215,768	2,654,586
Total	777,992	10,641,877	11,369,772

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Co.—The production of copper for March was equivalent to 1,428 tons of 2,000 lbs. each.

MOHAVE COUNTY.

(From Our Special Correspondent.)

Aztec Turquoise Co.—J. G. Doty, president of this company at Mineral Park, has put eight men to work.

Burro.—W. D. Smith, who has lately assumed the superintendency of this mine on Burro creek, is putting men to work.

Cupel.—This mine, at Stockton Hill, is reported sold to W. H. Cushing, of Topeka, Kan., for $25,000. The main shaft is 400 ft. deep.

Golden Gem.—The new owners of this mine, at Cerbat, have let a contract for 100 ft. of sinking.

Hardy.—A Minnesota company has taken a three months' lease and bond on this gold property at Silver creek. The workings are being cleaned out.

Samoa.—This mine, at Chloride, belonging to the Chloride Gold Mining Co., continues in good grade, shipping at the 300-ft. level. The output is two carloads a month, which is sent to the smelter at El Paso.

PIMA COUNTY.

Helvetia.—Preparations are being made for a resumption of work on this property, 25 miles southeast of Tucson. A 60-ton smelter is on the property.

Old Boot.—It is reported that the two old smelters on this property are to be remodeled during the present year. About 150 men are employed under superintendent Percy Williams. Much machinery has been installed recently to facilitate development work. The property is in the Silver Bell district, 45 miles west of Tucson, and embraces 60 well developed claims. It changed hands last May, being transferred from L. Zeckendorf, Albert Steinfeld and J. N. Curtis to the Imperial Copper Mining Co. for $500,000.

Twin Buttes Mining & Smelting Co.—About 40 men are employed on this property south of Tucson. It is equipped with hoisting plant, air compressors and drills.

YAVAPAI COUNTY.

Black Canyon Copper Co.—This company, it is reported, is preparing to erect a $75,000 smelting plant on its property in the Black Canyon district about 30 miles from Mayer. The main tunnel is in about 200 ft. and reported to have opened considerable ore.

Monica.—This property of five claims near Kirkland, owned by E. E. Beebe, T. M. Earnhart and E. B. Corthel, has one shaft down 80 ft. and another down 175 ft. connected by drifts. The owners have the Tremain mill leased, which is owned by the Model Gold Mining Co. A recent run of 84 tons of ore gave average returns of $18 per ton. Developments are stated to justify the erection of a milling plant, which it is reported will be put in with other machinery.

CALIFORNIA.

AMADOR COUNTY.

Climax.—This mine and mill near Clinton are again in operation.

Phoenix Reduction Works.—These works at Drytown, recently sold, are to treat the sulphurets from the Fremont Consolidated and Bunker Hill mines.

Sandpile.—The cyaniding operations at this property, near Forest Home, have been resumed after a short shut-down.

BUTTE COUNTY.

McGee.—This land, two miles south of Oroville, has been sold to the Viloro Syndicate, Ltd., of Great Britain and Ireland, for $160,000. A dredger has been contracted for. Representatives in San Francisco are O'Connor & Grant.

Straughan.—This property between Powellton and West Branch, W. W. Mason, superintendent, is employing 30 men. The mine is opened by a tunnel 2,500 ft. long.

CALAVERAS COUNTY.

German Ridge.—A pocket with about $8,000 was recently found in this mine near Dogtown.

Wild Goose.—Job Evans has drifted into a good gravel channel at this mine at Douglas Flat and 14 men are at work.

ELDORADO COUNTY.

Ford.—On this property at Georgetown, owned by El Dorado Copper Co., the tunnel has developed a small ledge of rich ore.

KERN COUNTY.

Caulkins.—This property at Rosamond has been capitalized for $1,500,000. The owners have already surveyed for water.

NEVADA COUNTY.

Greenhorn.—Work has been finished in the north tunnel of this claim and high-grade ore is being taken out.

PLACER COUNTY.

Three Stars.—The sale of this property at Ophir to E. H. Vance includes 280 acres of land and 11,000 ft. of lode, embracing 16 original locations. There are 20 different shafts on the claims, the deepest being 1,100 ft. There is a 20-stamp mill, electric plant and railroad, etc. B. F. Hartley is superintendent.

SHASTA COUNTY.

W. P. Hammon and others, of Oroville, have bought 1,050 acres of dredging land on Cottonwood creek for a stated price of $800 per acre. The land is in the southern part of the county and a dredger already in operation has proved the quality of the ground.

Gambrinus.—A rich strike has been made in this group at Whiskytown owned by Birner & Riebe of Redding. A tunnel 380 ft. long has been run at a depth of 600 ft. from the surface parallel with a vein of free gold ore. Over 3,000 ft. of development work have been done on the group and a 10-stamp mill will be erected.

Mountain Copper Co.—At the smelters of this company, Keswick, 600 men are at work,

and all five of the furnaces working. At mine and smelters about 2,000 men are employed on this property.

SAN DIEGO COUNTY.

Blue Hill.—This group, owned by Mr. Jacoby, of Julian, is being developed by a cross-cut tunnel which will tap the main ledge at 500 ft.

High Peak.—This mine at Julian, owned by the Julian Consolidated Mining Co., is keeping a 10-stamp mill busy on fair grade ore.

Owens.—In this mine at Julian, worked by Large & Son, a new duplex pump has been installed.

Pacific Steel Corporation.—This new company at San Diego, which has lately been reported contracting for iron ore in Mexico and coal in Alaska, is capitalized at $100,000,000 The officers are: Harrison Gray Otis, of Los Angeles, president; C. W. French, Cleveland, O., chairman board of directors; A. A. Pidman, Cleveland, vice-president; V. A. Dehnel, Cleveland, secretary; Willard Fuller, Cleveland, general manager. The Union Trust Co., of Pittsburg, will, it is stated, finance the steel plant.

SANTA CLARA COUNTY.

Guadalupe.—This quicksilver property, owned by the Century Mining Co., has been closed down indefinitely.

New Almaden.—These mines, owned by the Quicksilver Mining Co., have not produced much of late, although 300 men are at work. The company owns a large area of ground and there is a proposition to run a great tunnel through the property in endeavoring to locate paying ore.

SIERRA COUNTY.

Freeborough.—This mine, at Poker Flat, has been bonded by W. H. Corbiere, who will commence work at once. The ledge is a large one.

Sierra Buttes.—This large property is now being operated by the Hayes Bros., of San José, with W. D. Pinkstone as superintendent.

SISKIYOU COUNTY.

Headwater Mining Co.—This company, Jos. Johnson manager, has decided to erect a smelter in Humbug district.

Punch Creek.—This gold quartz mine, owned by Geo. W. Grayson, of San Francisco under the name of Mono Mining Co., has been sold to B. M. Newcomb. Mr. Grayson bought the property about a year ago and developed it into a good payer.

TUOLUMNE COUNTY.

Horseshoe Bend.—Plans have been made for a 100-stamp mill, but for the present 60 stamps will be put up.

Old Tuolumne.—At this mine, Columbia, a 7-ft. vein was recently uncovered.

Seminole.—This property, at Arastraville, is being unwatered and a thorough test of the ground will be made.

Soulsby.—An electric light plant has been placed in this mine, at Soulsbyville and sinking and stoping are in progress. The mill is doing well.

Starr King.—The mill at this mine, C. A. Holland superintendent, is running full time on good ore.

COLORADO.

BOULDER COUNTY.

Bird's Nest.—Good ore is coming from the 100-ft. level of this mine, near Eldora.

Enterprise.—This mine, near, Eldora, is being cleaned out and development work will be resumed shortly. The shaft is down 400 ft. and three levels have about 1,000 ft. of work completed.

Progressive Concentrating & Milling Co.—This company is remodelling the Boyd mill, at Boulder, and will start it shortly on material from several dumps, using a secret process.

Terror.—This mine is under bond and lease to W. M. Williams, of Boulder. It is being prepared for production.

FREMONT COUNTY.

Page.—This mill, at Florence, which has been idle for the past six years, was purchased recently by R. T. Tuthill and associates, of New York. Roasters will be added and operations will begin shortly.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Imperial Gold Mining & Milling Co.—This company, capitalized at $500,000, has taken hold of the Mackey and Sarah Jane groups in the Pine district, also the Mountz and Palmer 10-stamp amalgamating and concentrating mill and proposes heavy developments. L. J. Mountz, Apex, is manager.

Mutual Benefit Mining Co.—On the Pleasant View property the owners have discarded the present shaft workings and intend to sink an entirely new shaft, put up a plant of heavy machinery and erect new shaft buildings. W. C. Carnegie, Central City, is superintendent.

Penobscot Mining & Milling Co.—A big strike is reported at this property in Gamble gulch, the breast of the tunnel for over 50 ft. showing 5 ft. of ore, of which 18 in. is smelting ore carrying average values of over $60 to the ton, while the balance carries up to $20 per ton, and will make a first-class milling product. The owners will erect a 10-stamp mill inside of 60 days. P. J. Hamble, Perigo, is manager.

Roderick Dhu Mining Co.—Judge De France, of Golden, has issued an injunction restraining the company from taking any more ore from the Wheal Zor lode, pending a joint survey of the properties in the Nevada district.

Saratoga.—It is reported that a syndicate has obtained control of this large group. The property has a working shaft of nearly 1,000 ft. and the Newhouse tunnel is within 1,600 ft. of the main workings. The property is owned by Berry & Co., of Detroit, Mich., and has been a large producer.

Town Topics Gold Mining Co.—A shipment from the East Notaway 420 west level to the sampling works brought net returns of 27.55 oz. gold, 13.54 oz. silver and 3.7% copper or $538.39 to the ton. About 30 men are employed on leasing system. S. A. Josephi, Denver, is president and general manager.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

Bartlett.—New drifts have been started and other extensive prospecting is under way.

Chrysolite.—A good grade iron with fair silver values is being shipped and work is carried on in virgin ground.

Emmett.—Lessees are working at 800 ft. as the water has receded. Some good ore is coming from the other workings, while new work is being pushed in all directions.

Expansion.—Ore assaying 25 to 30 oz. silver and over an ounce gold was found recently. Several good ore stringers are also being followed in other drifts and the mine is preparing for regular shipments.

Fortune Gold Mining Co.—In the case against the Resurrection Gold Mining Co., Judge Sanborn, of the United States Court of Appeals, has reversed the decision of the lower courts and decided that the Resurrection Co. has not been guilty of trespassing on the territory of the Fortune as charged. The properties adjoin.

Green.—Shipments of fair grade material showing gold values are steady. The Green main shaft is being sunk another 100 ft. from the lower workings where the ore shoot is dipping away and a drift will then be sent to the known ore shoot.

Hensley.—This property of four claims in East Tennessee pass is to be started up next month. The 95-ft. shaft is to be sent to contact. It is on virgin ground.

Keystone Mining Co.—This company has a lease on the Rex property in Iowa gulch. The past week the entire surface plant was destroyed by fire, causing a loss of $2,000.

La Plata.—This work is all being done by lessees and some good ore is being shipped. Some good carbonates are reported opened up.

Midas Mining Co.—The output is 250 to 300 tons daily. The steam fittings are now being made and a $25,000 plant of machinery will be put in place. Sinking will be commenced by May 10.

Morning Star.—The recent find shows a good pocket of rich silver ore which is to be shipped. The lessees are prospecting for an ore shoot.

Quadrilateral.—Lessee Parks has resumed operations and is working on large deposits of zinc sulphides from which he is now shipping a carload a day.

Starr.—This California gulch territory will resume shortly under the direction of Con. Cunningham.

SAN JUAN COUNTY.

Ruby Basin.—The tunnel of this company, near Silverton, is in about 1,000 ft. and is reported to be in $17 ore. An upraise recently opened a rich lead ore body. Shipments will be made, it is stated, when the roads open.

Bullion King Gold Mining Co.—A gasoline engine, generator and two electric drills have been purchased for this property, in Porphyry basin, near Silverton, and buildings are to be put up at once. The tunnel on the Bullion King is in about 500 ft. A. J. Aurand is superintendent.

SUMMIT COUNTY.

Gold Belle Mining & Milling Co.—This company, on Mount Baldy, near Breckenridge, is driving a new tunnel, now in 100 ft., to prospect the group of lodes and cut two known veins.

Masontown Mining & Milling Co.—This company, near Frisco, has erected a 20-stamp mill and cyanide plant, which is expected to start about May 1 on the low-grade ore. A. E. Keables is manager.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

Miners' Strike.—At present it looks as though some effort might be made by the labor leaders to settle the strike, though it is not likely that the other side will listen to any overtures. Plenty of men are to be had, all the mines that wish can work, and as far as the district is concerned there is no strike except in name. Considerable dissatisfaction is shown by the few men still adhering to the union with the leaders, and it is understood that a number of men are surrendering their union cards. The Cripple Creek strike bids fair to stand as a monument of stupendous idiocy on the part of certain irresponsible leaders.

Old Gold.—A struggle for the control of the stock is probable at the annual meeting in Cheyenne. Two factions are trying to secure control. The work of getting the property into shape to be worked on company account is going on. The lease expired on April 1. W. H. Shell, of Cripple Creek, has charge.

Ophelia.—The breast of this tunnel is under Raven hill. Work stopped for a year, but recently started again. J. M. Parfet is in charge.

Portland Gold Mining Co.—Repairs at the No. 1 shaft are completed. The shaft was idle several weeks. The output was not curtailed in any way, as most of the hoisting has been done from No. 2 shaft. This property is reported in better shape than ever in its history.

Prince Albert.—An option on the control of the stock has been given local parties. The property is on Beacon hill and was one of the early shippers. Considerable ore has been taken out, mostly by lessees.

Wild Horse-Londonderry.—This suit, which was to have been tried in the district court this week, has gone over another week. The case involves the apex of certain veins, claimed by both sides, from which considerable ore has been taken. One-half of the Londonderry belongs to the Wild Horse and the ownership of the other half of the ore is to be decided. While the ore was being taken from the disputed territory a receiver was appointed by the court and one-half of the money paid into court pending a settlement of the case. A number of prominent engineers and lawyers are engaged on either side.

IDAHO.

IDAHO COUNTY.

Diamond Chief Mining Co.—The capital stock of this company is $2,500,000. It owns 16 claims on the west fork of Monumental creek, in the Thunder Mountain district. Two

tunnels have been under way the past winter, each being in 60 ft. The company also owns a group of claims at Copper camp, on lower Big creek.

Iron Springs Mining Co.—This company, working property on Rapid river, near Weiser, is employing about 60 men and has purchased a 200-ton cyanide plant.

Jumbo.—The March clean-up is reported to amount to $15,000. The ore is said to have improved and 24 stamps are working.

Weyant.—A 10-stamp mill, amalgamating plant, sawmill and water wheel have been purchased by this company, with property near Pollock. The plant is expected to be in operation by September 1. E. L. Hollingshead is superintendent.

SHOSHONE COUNTY.

Evolution.—A hoist and pump were put in at this mine, near Wallace, recently and work resumed with seven men on development work.

Snowstorm.—This mine, near Wallace, is reported shipping about 150 tons daily. The aerial tramway, over a mile long, is in operation and about 50 men are employed.

Standard.—The 14 new Wilfley tables are installed at this mill, near Wallace. Geo. Rugles is superintendent.

Wyoming.—The ore from this mine, in Grouse gulch, near Wardner, is being treated by the Silver King mill. O. R. Young is working the mine under a two-year lease.

ILLINOIS.

(From Our Special Correspondent.)

The various mining districts are now holding or have held their joint sub-district conventions with varying degrees of success. The Danville second sub-district and the Chicago & Alton fourth sub-district have reached an agreement. The Springfield fourth and the fifth and ninth districts are still trying to agree, the miners demanding more than they are entitled to under the State and Interstate agreements. It may be necessary to call on the miners' State officers to set the men right. In the meantime most of the miners throughout the State are at work pending these settlements, though there are a few spasmodic strikes.

VERMILION COUNTY.

(From Our Special Correspondent.)

J. H. Garaghty, of Chicago, president of the South Westville Coal Co., with Thomas English and other men of Danville, have organized the Riola Mining Co. and purchased several thousand acres of coal land south of and adjoining the holdings of the South Westville Coal Co. and Kelly Coal Co., and will open two, and possibly more, mines during the coming summer.

Peabody Coal Co.—This company of Chicago has purchased the Pawnee railroad, the Victor Coal Co.'s rights. The new company will lay heavier rails from Auburn to Pawnee and make other improvements.

INDIANA.

KNOX COUNTY.

(From Our Special Correspondent.)

The trouble between the miners and operators of the Knox coal mine, near Bicknell, over wet entries, which has existed for several months, has been submitted to arbitration, and the entries have been started.

VANDERBURG COUNTY.

(From Our Special Correspondent.)

M. T. Wilson, engineer, has filed suit in the Clay County Court against the United Mine Workers' Union, for $5,000 damages alleged to have been sustained by the Union forcing him to lose his position as engineer for the Crawford Coal Co., of Brazil. The suit is the outgrowth of the steps taken by the Mine Workers' Union to force the hoisting engineers to join the Mine Workers. All the hoisting engineers recently joined the Mine Workers, to hold their positions. Wilson contends that he is a member of the Hoisting Engineers' Association, and of the Locomotive Engineers. He refused to join the miners' union and the company discharged him, as the miners refused to work with him. This is the first time a labor union was ever sued in this State.

The Evansville & Ohio River Coal Mining Co.—This company will extensively develop its property at once. Contracts have been let for a complete electric mining outfit to equip a new mine near Slacer's Station. The company will secure additional property. The following officers were elected at a meeting in Evansville: E. R. Wood, president; J. R. Richmond, vice-president; W. N. Moore, treasurer; R. P. Miller, secretary; McE. B. Green, of Terre Haute, was elected as a director.

VIGO COUNTY.

(From Our Special Correspondent.)

After two weeks of contention, the joint committee of operators and miners in session at Terre Haute, reported to the joint conference that it could not agree on any of the demands. As a last resort former district president Hargrove moved that the agreement of last year be readjusted, the miners yielding their demands for a reduction in the price of powder, eight hours for engineers and firemen and regulations in regard to removing slate in certain localities. The operators also made concessions, and a two-year agreement was signed.

LOUISIANA.

ACADIA PARISH.

(From Our Special Correspondent.)

Jennings Oil Field.—Rayne Planters' Oil Co.'s well No. 1 came in and did 2,500 bbl. daily for a few days, then settled to a steady 800 bbl. Crowley Oil & Mineral Co.'s well No. 5 has been brought in at 1,820 ft. The Lafayette Oil Co. and the Morse Oil Co. have started new wells, and the Mermenteau Development Co. has purchased proven land for drilling.

At present there are about 75 pumpers, 4 gushers and 29 non-producers in this field.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

Calumet & Hecla.—The output of this mine for 1903 was 76,490,869 lb. refined copper, compared with 81,248,739 lb. in 1902.

Champion.—This mine is operating 54 drills, and three heads are fully supplied. When the added boiler capacity is installed for the new 100-drill air compressor the fourth head at the mill will be used.

St. Mary's Mineral Land Co.—A diamond drill is being rigged up half a mile south of the Winona's boundary, where three holes are already down.

Tamarack.—No. 2 shaft has been closed down and 75 single men discharged. It will not resume hoisting for four months. The smaller stamp mill at Lake Linden has also suspended operations, throwing 30 men out. The timbering of No. 2 shaft will be repaired for 300 ft. below the point of intersection of the lode. No. 2 was shipping 800 tons of rock daily, and to partially offset the decrease seven drills have been placed on the Osceola amygdaloid in No. 1 shaft. This shaft formerly shipped only 100 tons of rock daily, but a night shift of trammers has been put on and the output will be enlarged. Additional forces have been put to work in Nos. 3 and 5 shafts.

MONTANA.

CARBON COUNTY.

Northwestern Improvement Co.—About 600 miners employed by this company at the coal mines near Red Lodge, after being out on strike for over a week, returned to work on April 19, pending a hearing of their troubles by the company. The mines are controlled by the Northern Pacific Railroad.

DEERLODGE COUNTY.

Geyman Mining Co.—Permission was granted recently to the Butte & Boston Mining Co. to inspect the Geyman workings. The lower workings have been allowed to fill with water. The Geyman company is suspected of working the veins of the Harrington ground, which is owned by the Butte & Boston Mining Company.

MADISON COUNTY.

Revenue Mining Co.—Contracts are being let for machinery to be used in the new 75-ton cyanide plant, to be erected by July on this property at Norris. A four-mile pipe-line will also be built. Roger C. Knox is manager.

NEVADA.

LINCOLN COUNTY.

(From Our Special Correspondent.)

Empire Consolidated Mining Co.—This company has received a new engine and blower for its Empire tunnel, now in 265 ft. It is 7 by 8 ft. and in fine milling ore from 9 to 21 ft. wide. Streaks of sulphide ores show high values, and a crosscut has been started to cut sulphide ore body at a vertical depth of 500 ft.

New Era.—Work is temporarily suspended on this mine, awaiting material for the 10-stamp mill.

Newport-Nevada.—There are five claims in this group, near Fay. It belongs to Newport R. I., people, E. H. Hackett being superintendent and G. R. Yearsley metallurgist. Development shows two ledges cutting porphyry. The vein material comprises quartz, porphyry and spar. Each ledge is opened by an adit, one being in 120 ft. and the other 560 ft. A shaft down 200 ft. cuts one of the veins. The gold ore is partially free-milling. A mill is equipped with crusher, Chilean mill, amalgamating plates and cyanide leaching vats. A cyanide solution is used in the Chilean mill. The pulp, after passing over the amalgamating plates, is cyanided, the sands and lighter slimes being treated separately. Most of the values are in the quartz and black sands. The average value of the ore is $10 per ton.

Santa Fé.—Ben Macready has taken a bond on this group, just north of Searchlight, and has begun work.

Searchlight Mining & Milling Co.—This company is down 250 ft. with its main shaft. A drift here showed a vein 15 ft. wide.

ESMERALDA COUNTY.

(From Our Special Correspondent.)

Combination.—In this mine the main shaft is down 165 ft., where the ore is changing from oxides to sulphides, carrying the same high values as heretofore.

Goldfield.—Further returns from ore shipped by the lessees of the January claim show 23 tons gross returns $2,549; net, $2,020; 30.5 tons gross, $3,972; net, $3,251. Three shafts have been sunk to depths of 112 ft., 100 ft. and 20 ft., from all of which about 14 tons of shipping ore are raised daily; the milling ore averages $40 per ton. A crosscut at the lowest level has penetrated 35 ft. of solid ore.

NEW JERSEY.

SUSSEX COUNTY.

New Jersey Slate Co.—At the annual meeting in Newton recently S. H. Hopkins was elected president and treasurer; Charles Robeson, secretary. The following board of trustees was chosen: S. H. Hopkins, J. Arthur Hamilton and Charles M. Woodruff. Mr. Hamilton had been president of the company since becoming interested in its affairs.

NEW MEXICO.

OTERO COUNTY.

Jarilla Mining & Smelting Co.—This company has taken a five-year bond on 20 claims of the Jarilla Mining Co., at Jarilla, under which it contracts to start building a 100-ton smelting plant within six month. It is said the company will take over the By Chance group of the Cincinnati Gold Mining Co. The directors are R. G. Mullen, W. S. and F. E. Boynton, F. R. Jeffrey, D. D. Hunt and J. K. Mullens, of Colorado Springs, Colo., and E. E. Sidebottom, A. J. King and E. J. Dedman, of Alamogordo.

SANTA FE COUNTY.

Sunny Slope Gold Mining Co.—The mill on this property, near San Pedro, known as the St. Larazus group, is to be improved and work resumed under new management.

SOCORRO COUNTY.

Graphic, Idaho Hill and Contact.—W. H. Cottingham, of Terre Haute, Ind., has bought these lead and zinc mines, at Magdalena, for $175,000. The zinc has been shipped to Joplin, Mo., for treatment, but it is reported that the new owners will erect concentrating works at the mines.

Last Chance.—The 24-stamp mill at this mine, in the Mogollon mountains, near Socorro, is being enlarged to handle 2,000 tons of ore per month. E. Craig is manager.

TAOS COUNTY.

Keystone-Bromide Mining Co.—This company was recently organized to merge the properties of the Keyston and Bromide Mining Co.'s., near Tres Piedras. A 6,300-ft. tunnel will be driven on the Bromide claim to tap the shaft of the Payroll mine and afford drainage. Shipping ore is reported opened in the Bromide shaft at 150 ft..

NORTH CAROLINA.

Capps.—This mine, 5.5 miles northwest of Charlotte, has passed into the control of the Capps Mining Co., which is preparing to resume work on a large scale and to add a chlorination plant to its 10-stamp mill and concentrators. The property is one of the oldest mines in the State, and is equipped for extensive work. It has three shafts 90, 160 and 180 ft. deep and over 2,000 ft. of drifts. The company is reported to have an offer from English buyers for the entire output for export to English smelters.

OREGON.

JOSEPHINE COUNTY.

Allen.—This copper-gold mine on Rogue river, 3½ miles south of Galice creek, has been sold by C. J. Allen, of Portland, and associates, to Charles d'Autremont, of Duluth, Minn., and others for a reported consideration of $750,000. The Oregon Homestead Mining & Reduction Co., has been incorporated to work the property in which C. J. Allen has retained a heavy interest and will be the president. Frank B. Roberts is vice-president and general manager, and W. T. Perry, secretary and treasurer. It is the intention to dam Rogue river and operate two power stations, one at either end of the dam. The property has been developed the past three years and is said to contain 4,500 ft. of the Yank ledge.

PENNSYLVANIA.

ANTHRACITE COAL.

The Board of Conciliation has decided that the increase of wages awarded by the Anthracite Coal Strike Commission shall be, for contract miners, 26% on the basis rate of April 1, 1902; from the gross earnings' charges for supplies shall be deducted and the resulting earnings shall be the basis on which are calculated the advances under the sliding scale. For company men 16% shall be added to the basis rate of April 1, 1902, and this amount shall be the basis of advances under the sliding scale. The award takes effect April 1, 1904.

BITUMINOUS COAL.

Graceton Coke Works.—These works in Indiana county will resume before May 1 and employ about 5,000 men.

H. C. Frick Coke Co.—The 225 ovens of this company at Dorothy are expected to be fired up by April 22. They were closed last December.

Nixon.—At this mine of the Pittsburg Coal Co., near Carnegie, on April 18, an Italian laborer carelessly exploded a charge of powder, killing himself and injuring nine other miners.

SOMERSET COUNTY.

During a riot at Garrett, on April 19, the house of a former employee of the Garrett Coal Co. was set on fire and six persons were burned to death. The riot grew out of the strike of the miners last December, when miners' wages were reduced 10c. per ton. A number of union miners who lost their places then, it is reported, determined to drive from town the non-union men who supplanted them. The sheriff is now in control of the situation.

SOUTH DAKOTA.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Gilt Edge Maid Mining Co.—Plans are being drawn for a 150-ton cyanide mill to be built in early summer. A $50,000 bond issue was authorized, and reported subscribed for. J. L. Turner, of Springfield, S. D., is president; William Lardner, of Deadwood, vice-president; W. D. Lowry, of Minneapolis, treasurer; John R. Wilson, of Deadwood, secretary; G. A. Duncan, of Deadwood, manager. The company controls 132 acres of patented land, embracing the old Dakota Maid and Gilt Edge groups.

Penobscot Mining Co.—A new shoot of ore has been discovered east of the main shaft, and carries good values. The company has ordered a 24-drill air compressor. The 40-ton wet crushing cyanide mill is making good clean-ups regularly.

Puritan Gold Mining Co.—The 10-stamp mill of the North Star Mining Co. has been purchased, in addition to a steam hoist. The company is working in Strawberry gulch.

TEXAS.

HARDIN COUNTY.

(*From Our Special Correspondent.*)

Batson's Oil Field.—New wells in are: Moonshine Oil Co. (2 wells), Wood & Co., Lovett & Davis, Sterling Oil Co. Eighty per cent of the output of the last well is said to be water. About 13 wells are producing and the daily production has declined to 30,000 bbl. The outlook for wells in the deep sand is bad on account of salt water. Drillers are stopping in the second or the first strata,. and owners of salt water producers are pulling their tubing to the upper sands.

JEFFERSON COUNTY.

(*From Our Special Correspondent.*)

Beaumont Oil Field.—The United Oil & Refining Co. is not in charge of a receiver, but the custody of 100,000 bbl. of oil has been given to M. Eastman by the Court pending judgment in a suit to enforce a contract for sale made to the Moore-Skinner syndicate.

Cartwright Oil Co.'s well No. 2 is in. The oil market is dull with wide variance in quotations. Some sales at 60c., others at 50c. The uncertainty of the Batson production makes both buyers and sellers very cautious.

High Island.—A dispute regarding use of water for drilling has caused H. W. Carroll to discontinue drilling. With good prospects here results have been disastrous. A lot of money has been expended and no well has yet been completed to test the field.

UTAH.

BEAVER COUNTY.

(*From Our Special Correspondent.*)

Blue Acre.—Cross-cutting to the main ore body on the 250-ft. level is in progress. It is expected to be cut within the next 75 ft.

Cactus.—This property, belonging to Samuel Newhouse and associates, is in Copper gulch, three miles from Frisco. The main shaft is down 600 ft. From the bottom of the shaft a tunnel driven west 1,350 ft. cuts copper veins, and will connect with a tunnel being driven from the opposite side of the mountain spur, now in 2,200 ft. Air drills are used and the work at both ends equals 100 ft. per week. The new concentrating mill will be a mile from the portal of the town of Newhouse. A pipe-line, 8.5 miles long, delivers water from Wah Wah springs to this point. The railroad branch from Frisco may be extended 7 miles to the millsite. The ore will be sent to the mill through the tunnel.

Horn Silver.—This property, at Frisco, is now under the management of P. T. Farnsworth, of Salt Lake City. Shipments in March amounted to about 100 cars of lead and copper ore. The 100-ton concentrating mill is busy most of the time, depending upon the water supply which comes from the 1,600-ft. level in the mine. The concentrates run from 40% to 45% lead and 12 oz. to 20 oz. silver, with small values in gold. Lead ore from the 300-ft. level is said to run 42%, with 9 oz. to 14 oz. silver and copper ore from the same level 27% copper and 17% lead, with some silver and gold. Much of the lead is a sulphate and the copper a carbonate. On the 700-level the ores are lead and copper sulphides with silver and gold. A shoot of zinc ore is said to be traceable from the 300 to the 1,100-ft. level. It is given out that Peck Bros. are to erect a zinc plant, the Horn Silver Co. having agreed to furnish 50,000 tons of zinc ore.

GRAND COUNTY.

(*From Our Special Correspondent.*)

Interstate Mining & Milling Co.—This company is preparing to install a cyanide plant in the near future. J. H. Clark, of Castleton, Utah, is superintendent.

IRON COUNTY.

(*From Our Special Correspondent.*)

Johnny.—This plant has been repaired and is operating again.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Consolidated.—The copper bullion shipments from this smelter aggregated 183,282 lb. during the week ending April 16.

United States.—Copper bullion shipments from this smelter during the week ending April 16 aggregated 248,046 lb.

Utah Consolidated.—Shipments of copper bullion from this smelter for the week ending April 16 aggregated 302,795 lb.

TOOELE COUNTY.

(*From Our Special Correspondent.*)

Honerine.—The Western Exploration Co., in which W. F. Snyder and P. L. Kimberly are principals, owns this property at Stockton. The Honerine tunnel, 6 by 8½ ft., is now in 6,400 ft., the heading being within 600 ft. of the main 3-compartment shaft from an upper tunnel. The machinery includes a Rand cross-line tunnel is 700 ft. below the old tunnel and will give 1,200 ft. depth on the ore zone. A system of veins between quartzite and blue lime show oxydized ore above water level, and heavy sulphides at and below water level. The flow of water from the tunnel, about 3,600 gal. of water per minute, is ample for milling. E. J. Raddatz is general superintendent. The new Honerine mill, having a capacity of 450 tons in 24 hours, is near the portal of the main tunnel. The machinery, including a Rand cross-compound air compressor for the drills. The ore is crushed by a No. 4 Gates crusher and two sets of rolls, sized by screen jigged, classified and concentrated on tables. The overflow slimes from all sources are classified and settled in Sherman slime tanks. The products consist of various grades of silver-lead concentrates, the bulk of the ore milled is oxides and carbonates, the great future of the mine being in the sulphide bodies to be taken out through the main tunnel.

Stockton Gold Mining Co.—This company is about to install a powerful hoisting plant. J. J. Trenam, of Salt Lake, is manager.

WASHINGTON.

FERRY COUNTY.

(*From Our Special Correspondent.*)

Golden Eagle Mining Co.—At a meeting held recently the old board of directors was elected as follows: M. R. Staight, C. B. Stranahan, J. V. Brown, A. F. Burleigh and H. B. Ackerman. The Golden Eagle shaft is down 400 ft. C. S. Verrill is in charge of the work.

Midnight Mining Co.—This company has acquired the Holyoke, Deer Head and Elk claims on Belcher mountain.

Nob Hill.—Lessees are driving northward on the 150-ft. level, alongside the vein, which averages about 5 ft. in width.

Stray Dog.—The title to this property has passed from C. Baker Olmstead to Elizabeth Baker Paine, of New York City.

Tom Thumb Gold Mining Co.—Under a reorganization the name of this company has been changed to the Midget Gold Mining Co., and the

stock made assessable. The new company has taken over all the property of the old company.

Zala M.—The lessees will sink the winze from the 350 to the 450-ft. level and extend the south drift on the vein at the 350-ft. level. Four men are stoping ore above the 350-ft. level.

WEST VIRGINIA.

Coal Miners Wages.—Operators in the Fairmont-Clarksburg district gave notice of a reduction of wages of 4c. on machine work, 7.5c. on pick work and 10c. per day on labor, effective April 15.

FOREIGN MINING NEWS.

AUSTRALIA.

QUEENSLAND.

The Mines Department reports the production of the State in February at 50,775 oz. fine gold, against 51,270 oz. in February, 1903; showing a decrease of 495 oz. this year.

WESTERN AUSTRALIA.

The production of gold in March is reported at 163,929 oz. bullion, a decrease of 30,994 oz., as compared with March, 1903. This decrease brings the production for the quarter below that of last year, the total for the three months ending March 31 being 569,423 oz. bullion, against 597,572 oz. last year, showing a decrease of 28,149 oz. The bullion reported this year was equal to 475,942 oz. fine gold, or $9,837,718 in value.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—For the week ending April 9 shipments aggregated 15,487 tons as follows: Granby, 11,374; Mother Lode, 3,552; Emma, 495; Oro Donoro, 66; total for the year to date, 231,534 tons.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—For the week ending April 9 the total shipment was 5,873 tons, as follows: Le Roi, 2,944; Centre Star, 1,411; War Eagle, 918; Le Roi No. 2, 600; total for the year to date, 123,964 tons.

MEXICO.

CHIHUAHUA.

Pan-American Smelting & Refining Co.—This company, it is reported, has purchased from Stallforth & Co. the Quebradillas of Minas Nueva for $750,000 gold. Considerable new machinery and pumps will be installed.

DURANGO.

Santa Lucrecia.—This property, near the Pedreguera and Santa Rita mines, is reported sold to an American company for $3,000,000. The owner was Vicente Estrada.

ZACATECAS.

Mazapil Copper Co.—This company of Concepcion del Oro is to establish a large smelter plant at Saltillo. The company has a smelter at Concepcion del Oro and owns a railway running between that point and Saltillo. The Saltillo smelter is intended to take care of custom work.

MINING STOCKS.

(Full quotations given on pages 669 and 670.)

April 20.

Trading is narrow, and prices of leading securities have settled since last week. Expectation is the keynote of the market to-day.

Amalgamated slipped off to $49.125, then rallied around $50, and moved the pendulum fractionally either way, while sales were small. Anaconda moved up to $18.50, then weakened, but transactions were limited. Greene Consolidated, of Mexico, sold down to $14.50. Montreal & Boston, of British Columbia, looks brighter, reflecting, perhaps, the proposed consolidation with the Dominion, Athleston & Jackpot, Morrison and Emma mines, from which $150,000 is hoped to be realized for working capital.

Twenty shares of Homestake, of South Dakota, indexed a price of $50, just half par value.

Colorado gold stocks are undisturbed, though Elkton made a sale at 67c., and Isabella at 28c.

The Comstock shares move with their usual slowness while assessments are on the docket. Mexican changed hands at $2, Union at 90c., and Sierra Nevada at 67@68c. Silver Hill, paying dividends, made an exchange at 67c. per share.

Boston. April 19.

(*From Our Special Correspondent.*)

The market for copper shares is again dead, and prices have gone to a lower level during the week. There has been no apparent offering of stocks and the decline can be attributed to a state of inertia. The open warfare between Operator Lawson, of Boston, and H. H. Rogers is undoubtedly a contributing cause, as the traders and public alike are in a quandary, preferring to wait and see results.

Daly-West has been an exception, as offerings have been large. The price touched $20.62½ last Thursday, but subsequently it rallied to $22.50, and closed Monday at $21, against $23.75 a week ago. To-day, April 19, is a State holiday, it being the anniversary of the Battle of Lexington, and consequently there was no stock market. The May Daly West dividend is expected to be 40c. Insiders are reported to have sold considerable of their stock holdings.

Copper Range has been fairly active, but the result has been $1.50 decline to $42, with fractional recovery. Mohawk has gone off over $2 to $41, Parrot $1 to $24, Osceola $1.50 to $57.50, and Utah touched $33.12½ on light dealings. Centennial fell $1.62½ to $19.25, but recovered to $20. Reconstruction of the Centennial mill will commence in May. Bingham has lost a fraction to $22. This company has authorized a $1,000,000 bond issue to run 20 years and convertible into stock. These bonds will take up a $300,000 issue of bonds outstanding at present. The company is earning at the rate of $30,000 net per month, and at present has no pressing indebtedness, so that there is no necessity for issuing these bonds for a while. Last year the Bingham earned about $250,000, which was spent on the property, and since the beginning of the present year the company has paid off $100,000 floating debt.

Old Dominion is firm at $13. The production and shipments the first 10 days of April were 500,000 lb. of copper. The March cost of copper was not over 8¾c. It is learned that the so-called Old Dominion trust, over which there has been so much controversy, was formed to represent certain assets and liabilities of the Old Dominion of New Jersey, which did not enter the sale to Phelps, Dodge & Co. under the proposed Old Dominion-United Globe merger. The assets comprised flue-dust and ore valued close to $80,000, and two suits in this State against A. S. Bigelow, and two suits in New York against the estate of the late Leonard Lewissohn.

Colorado Springs. April 15.

(*From Our Special Correspondent.*)

The market at the close of this week is in rather a better condition than it was a week ago, although trading is still dull. Prices as a rule have held up well, and some few advances have been recorded, mainly in dividend-paying securities. Several companies have disbursed substantial dividends within the current month, and this fact is responsible for the strength of this class of stocks. The Portland Co. declared a double dividend or 6c. per share, amounting to $180,000. El Paso Company distributed $25,000, the Mary McKinney $30,000, and the Vindicator $33,000.

Work has been started by a number of individuals and companies who were recently granted leases on the Stratton properties, and the result of their operations should be felt in the immediate future. Stratton's Independence, Ltd., of London, owning the property of the same name, has adopted the leasing system, and the first leases upon this valuable property were granted to-day. The company expects to realize a considerable amount of money from the royalties on these leases.

Salt Lake City. April 16.

(*From Our Special Correspondent.*)

Little interest is being manifested in mining stocks by the investing public. During the past week the market has been anything but encouraging. Daly West is still demoralized and the stock sold down to $21.25, closing slightly stronger. Consolidated Mercur has fallen, closing the week with 45½c. bid for it. The management of the Butler-Liberal, of Bingham, is preparing to inaugurate heavy shipments of ore and the stock has been in considerable demand.

Tetro shipments have been lighter and the uncertainty as to when a dividend will be posted has caused a reaction. The directors of the Utah mine, of Fish Springs, posted the monthly dividend of $1,000, and 100 shares were bought at 55c. On account of the trouble between the stockholders of the Star Consolidated the stock has been weaker. A new board of directors will be chosen at the adjourned meeting, to be held April 23.

San Francisco. Mar. 31.

(*From Our Special Correspondent.*)

The market for the Comstock shares has been rather weak, and the sales and trading generally have been confined to the regular operators. Towards the close, however, there was a little more firmness in the North End stocks.

Some quotations noted are: Ophir, $5@5.25; Mexican, $2@2.15; Best & Belcher, $2.10; Consolidated California & Virginia, $1.65; Sierra Nevada, 65@70c.; Savage, 39c.; Yellow Jacket, 26c.; Potosi, 20c.; Crown Point, 15c. per share.

The sworn statements of the mining companies, as filed in their offices this week, show cash on hand, April 1, as follows, with all expenses paid, unless otherwise noted: Alta, $171, with indebtedness of $3,999; Alpha, $996; Andes, $2,311; Belcher, $265, with March expenses unpaid; Best & Belcher, $94, with indebtedness of $1,500; Bullion, $2,338; Caledonia, $2,943, with March expenses unpaid; Crown Point, $566; Consolidated Imperial, $621; Challenge, $2,614; Confidence, $45, with $581 due treasurer and March expenses unpaid; Chollar, $489; Consolidated New York, $1,504; Exchequer, $2,098; Gould & Curry, $2,340; Hale & Norcross, $1,034; Julia Consolidated, $140; Justice, $812; Mexican, $6,999; Ophir, $73,018, with eight carloads of ore in transit; Overman, $366, with $2,700 due treasurer and March expenses unpaid; Potosi, $6,939; Savage, $5,585; Segregated Belcher, $2,612; Silver Hill, $10,053; Sierra Nevada, $5,754; Standard Consolidated, $98,591, with March expenses and March clean-up to be accounted for; Syndicate, $2,618; Union Consolidated, $281; Utah Consolidated, $796.

The Consolidated California & Virginia Company reports no cash on hand April 1, with an indebtedness of $115.

On the San Francisco & Tonopah exchange business was quite active, especially in the low priced stocks. Montana Tonopah sold at $1.45; Tonopan Belmont, 60c.; Tonopah North Star, 30c.; Evelyn, 7c. per share.

On the California exchange business in oil stocks was quite active, and prices generally firm. There were sales of Hanford at $175, cash, and $180, buyer 90 days. Home sold at $1.60@$1.65; Sovereign, 44c.; Oil City, 40c. a share.

COAL TRADE REVIEW.

New York, April 20.

ANTHRACITE.

In the anthracite trade there is a strong demand for coal at the April price from all points where the conditions permit dealers taking advantage of the discount. Only in the Northwest, where there is little prospect of coal arriving, owing to the late opening of navigation, before some time in May, is wholesale business quiet. Retail trade generally is much livelier than usual at this season, owing to cold, raw weather. At many inland points the need of coal is almost as great as during the winter.

There has been some newspaper talk of the miners being dissatisfied with recent rulings of Mr. Wright, umpire for the Conciliation Board, and that they would refuse to accept further decisions that did not favor them. This talk means little, except that the men have not got all that they expected. There is no likelihood of any serious labor troubles at the mines this year. Neither is there any prospect that the self-advertised smasher of the 'Coal Trust will accomplish more than what he probably actually seeks, that is to make some cheap capital for political use. At all events the mining companies show no alarm.

Trade in the Northwest is quiet; no coal is expected to arrive at upper lake docks before the middle of May. Country yards have been taking advantage of the April discount, resulting in some movement of coal from the docks. In Chicago territory demand for anthracite has been very heavy, and receipts by rail are insufficient to meet it. Retail buying has been effected by cold weather, and has been quite brisk. Along the lower lakes and in Canadian territory demand is good and the amount of coal arriving cannot meet all wants. At Buffalo some coal is being loaded on boats for shipment up the lakes as soon as conditions permit. Along the Atlantic seaboard retail demand for the prepared sizes is still strong, and April sales promise to be unusually large. At wholesale, buying to take advantage of the April discount is heavy. Conditions generally favor the shipment of coal, though there is some complaint over exactions of vessel owners. With the lessening demand for fuel to supply steam heat in apartment houses and office buildings, there is a natural falling off in the demand for the steam sizes. Considerable amounts are reported in storage and the market is weak.

BITUMINOUS.

The Atlantic seaboard bituminous trade is moving along quietly. Contracts for the new year are being closed more slowly than a few weeks ago, but some are closed daily. The movement of coal from the mines is free, car supply now being sufficient for all demands.

The chief subject now discussed in the trade is the recent combination of vessel owners and brokers to advance freights, particularly the demand that vessels be loaded and discharged in 10, 12 or 14 days, according to size. Some members of the association now admit that the period demanded is altogether too short for large craft, but as yet no organized opposition to the combination has developed. Probably, however, there will be changes made in the loading and discharge clause. Possibly the vessel owners may require a certain time for loading, and give the association bill of lading for discharging, but it is plain that the charter of a vessel can, with equal force, demand the arrival of the vessel on a certain date.

Beyond Cape Cod considerable coal is wanted, but the trouble over water transportation delays shipment, consignees generally declining the offered loading and discharge clause in charters. Along Long Island sound trade is quiet. Consumers seem to think they will have no trouble in getting what coal they want during the summer at short notice. At New York harbor points, where there is a fair demand, the supply is ample, owing to prompt transportation. The all-rail trade is calling for about the same tonnage as for several weeks.

Transportation from mines to tide water is excellent, coal running through in four or five days. The sidings along the railroads are cleaned out, and no old coal is being held back. Car supply at the mines is pretty well up to the demand. Only in particular increases of demand is the supply at all slow. In the coastwise vessel market vessels are rather scarce, with rates firm. We quote current rates from Philadelphia as follows: Boston, Salem, Portland and Portsmouth, 90c. for large craft and $1 for small craft; Providence, New Bedford and Long Island sound, 70c.; Bath, 95c.; Lynn, Newburyport, Gardiner, Bangor and Gloucester, $1; Saco, $1.10.

Birmingham. April 18.

(From Our Special Correspondent.)

There is steady work in the coal mines of Alabama considering the season of the year. The real warm weather has not set in yet, but the demand has fallen off in anticipation of the change in climatic conditions. Several large consumers will begin shortly laying in a supply in order to be ready for any interference with the production which may be experienced during the summer.

State Mine Inspector J. M. Gray states that the production is still strong and that so far he notices but little falling off. With his assistants he is giving much attention to reducing the number of fatal accidents in the mines in this State. Three deaths have taken place this month in the mines of Alabama, bringing the list for the year so far to 31. No little attention is being given to the ventilation of the mines, and a good report is made for the Alabama mines in this direction.

There is very little, if any, complaint made as to the transportation facilities in the coal fields of Alabama now.

Chicago. April 18.

(From Our Special Correspondent.)

The wholesale coal market continues to be marked by activity—though somewhat lessened—in the anthracite trade, and dullness in the bituminous market. Delay in the opening of navigation has caused a continuation of the good business in all-rail coal existing for a month past. The coming week, undoubtedly, will be better than its predecessor in the anthracite field, as it is the history of the trade that orders accumulate in the last half of the month, under the system of graduated discounts that begins April 1 of each year. Inquiries and orders indicate that the anthracite business for the spring months will be unusually large, because of the hard winter just closed and the experience of consumers showing that it is profitable to order early. The graduated system of discounts is, according to the large dealers, a success; it distributes buying over the spring and summer months instead of bunching it in the autumn, thereby benefiting producers, dealers and consumers. The April car price of $6 for egg, stove and chestnut causes a local retail figure of $7.50, which price will be advanced 10c. per month up to September 1. Indications are that extensive orders will be filled by the retailers after May 1 at the April price, on account of the opening of navigation. There is little free anthracite in the market now.

In the bituminous market the leading grades continue to be Indiana and Illinois, with Eastern coals generally suffering from an overplus on track and a comparatively small demand. Quotations at which actual sales are being made are: Hocking, $2.90@$3.10; Youghiogheny, $3@$3.20; West Virginia, $3@$3.20; Smokeless, $2.70@$3.50; Illinois and Indiana, $1.90@$2.60 for lump, $1.60@$2 for run-of-mine and $1.40@$1.50 for screenings. Hocking has been in unusually light demand and smokeless is apparently in too heavy supply. Western coals lead the market, such as it is.

Cleveland. April 19.

(From Our Special Correspondent.)

The coal market in this territory is dependent upon the opening of the season of navigation, which is delayed much further than is customary. The failure of the lakes to open has thrown upon the market here a large supply of steam coal. The producers, in order to find a market, are willing to sell it at a loss, if necessary, and as a result the market is back to bottom figures. Pittsburg coal is bringing $1.05 at mine, or $2, Cleveland, while Ohio coal is bringing $1.05 at mine, or $1.75, Cleveland. There is a plethora of the material at those prices. The demand for slack, which was strong a short time ago, has suddenly slumped and that material is selling at 50@60c. at mines.

As to the lake situation there is very little new. The channels between the lakes are still clogged with ice and no boats are yet trying to pass. Some of the railroads, which bring coal to the lakes, are reporting losses in their earnings as compared with the same period a year ago. The demand in the Northwest is strong and the supply there is running short.

Pittsburg. April 19.

(From Our Special Correspondent.)

Coal.—Coal freight rates to the lakes may be reduced at a meeting of the traffic heads of the railroads interested in the transportation, to be held in Pittsburg on Friday. At the last meeting the rates for the season were reaffirmed, despite the fact that they were 10c. a ton higher than the rates of 1902-03 and that the mining rate this year had been cut 5.5% and prices for lake coal had been cut 15c. a ton. It is now believed the railroads will make a concession. If this is done, Pittsburg interests that ship to the northewestern markets believe the tonnage this season will exceed that of last year. All the mines are running satisfactorily, particularly along the river, there being enough empty coal boats and barges on hand to insure steady operation for several months. The rivers continue navigable and there is less than 6,000,000 bush. in the pools and harbor.

Connellsville Coke.—Production and shipments in the Connellsville region continue about the same as the past few weeks. Production last week was 225,937 tons, compared to 225,153 the previous week. The shipments were 10,587 cars, compared to 10,718 cars the week before. Prices are a trifle lower, furnace coke being quoted at $1.65@$1.75 and foundry coke at $2.15@$2.50. The shipments for the week were distributed as follows: To Pittsburg and river points, 3,665 cars; to points west of Pittsburg, 5,462 cars; to points east of Everson, 1,460 cars.

San Francisco. April 14.

(From Our Special Correspondent.)

Mr. J. W. Harrison's circular, dated April 14, says: "The very exceptional condition is shown of no arrivals of Australian coal, and it is now nearly one month since the last shipment from Newcastle arrived. There are four vessels now en route to this port which are fully due; several new names have been added this week to the chartered list of coal carriers which now figures up in all 31 vessels, with a carrying capacity of about 80,000 tons, but some of these vessels will not load before July or August next. The Australian coal now here in yard amounts to very little, and is almost entirely held by one wholesale dealer, hence prices are well sustained. As spring weather has put in an appearance the sales of household coals will materially diminish. Freight rates on coal from Newcastle are reported much firmer, caused presumably by the freight rates on grain to Europe from colonial ports. There is but little demand here for all grades of foreign fuel which are only suitable for steam purposes, as the prices demanded for British Columbia and Washington steam coals make it impossible for outside coals to compete. An accurate report of the California output of crude oil for 1903 has just been issued, showing that 23,000,000 bbl. have been sent to the surface. This in round figures signifies the displacement of fully 6,000,000 tons of coal fuel."

Pacific coast coals in large lots to dealers are quoted as follows: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coss Bay, $5.50; white ash, $5.25. For Rocky Mountain coals, ex-car, to dealers, prices are $14 for Colorado anthracite, $11.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside. Eastern coal is nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. Foreign coal in cargo lots is quoted at $13 for Welsh anthracite. $8.50 for cannel, and $7.50 for Wallsend and Brymbo.

Foreign Coal Trade. April 20.

There is nothing new to report in foreign trade here. The war in the East has not brought the demand for coal shipments from Atlantic ports which some people expected.

Messrs. Hull, Blyth & Co., of London and Cardiff, report, under date of April 9, that the coal market is firm. Very bests are scarce and dear. All other qualities remain steady. Quotations are: Best Welsh steam coal, $4.56; seconds, $4.20; thirds, $4.08; dry coals, $3.78; best Monmouthshire, $3.84; seconds, $3.54; best small steam coal, $2.04; seconds, $1.68; other sorts, $1.56.

The above prices for Cardiff coal are all f.

o. b. Cardiff, Penarth or Barry, while those for Monmouthsire descriptions are f. o. b. Newport, both exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2.5% discount.

The freight market is showing more life and rates for the Mediterranean are rather better. Some rates quoted from Cardiff are: Marseilles, $1.40; Genoa, $1.41; Naples, $1.32; Las Palmas, $1.44; St. Vincent, $1.56; Rio, $2.04; Santos, $2.46; Buenos Aires, $1.74.

IRON TRADE REVIEW.

New York, April 20.

The iron and steel trades are still quiet, suffering to some extent from the reaction following the recent activity. Buying of pig iron and steel billets has been somewhat less, though prices are strong, and for anything past the second-quarter furnacemen are not anxious to sell except at a slight advance. The Southern companies, especially, are firm in this particular, holding for $10 or $10.25 Birmingham for No. 2 foundry as a basis.

Ore prices are still slightly uncertain, the result of the last meeting having been unsatisfactory. It is understood, however, that there will probably be a reduction of 50c. on last year's prices as a compromise, this amount being less than the independent producers were willing to make.

The settlement between the United States Steel Corporation and the Crucible Steel Company of America, with regard to the Clairton plant, is reported to have been made at a conference held in New York this week. The terms are not made public, but it is said that the Steel Corporation has entertained a new proposal for the purchase of the Clairton plant or for a guarantee of interest on the bonds which will be increased for the purpose of funding the large floating debt. The Clairton property is now in the hands of receivers.

Pig Iron Production.—The reports of the furnaces on April 1 show that on that date there were anthracite and coke furnaces in blast, having a weekly capacity of 337,500 tons. This is 152,000 tons more than reported on January 1, and is the highest weekly capacity noted since July last. One feature of the situation is that the furnaces recently blown in are chiefly those belonging to the large steel companies. This, combined with the recent refusal of the Steel Corporation to take up options on outside iron, indicates that its future policy will be to produce its own iron, as far as possible, and to discourage the activity of the merchant furnaces. The *Iron Age's* estimate of pig iron production, which is usually rather conservative, is 1,465,507 tons for March and 3,592,187 tons for the quarter. The same paper estimates merchant stocks unsold on April 1, at 455,673 tons, this figure not including iron held by the large steel companies for their own use. This total shows a decrease of 142,231 tons from January 1.

The American Pig Iron Storage Warrant Company reports 69,700 tons in its yards on April 1, being an increase of 5,700 tons during the month.

Birmingham. April 18.

(*From Our Special Correspondent.*)

Announcement was made during the past week that a small lot of pig iron had been sold in the Birmingham district on a basis of $10.50 per ton for No. 2 foundry. It was given out that the stipulations were immediate delivery. It was, however, a new price for the year, and it is believed that by the end of this week will be the regular quotation. There is some iron still being sold in this district on the $10 per ton basis for No. 2 foundry, but small lots have been sold at $10.25 and $10.50. Reports have been current that some sales have been made recently under $10 per ton, but inquiry among the manufacturers does not locate any such sales.

Very few of the companies in the southern territory are anxious to get business for delivery before July 1, anyhow, and though inquiries are being received for iron after July 1, the manufacturers are acting slowly. Some are quoting for delivery after July 1, but are adding on to the quotations for an expected advance in regular prices and are also taking precautions against any possible disturbances in labor, etc.

During the past week another furnace went into blast, that of the Republic Iron & Steel Co. at Thomas. The furnace will be making 250 tons of iron daily when it is in regular working trim. As far as can be learned, there is no delay in the transportation of the product from the district.

The following quotations are given in this district: No. 1 foundry $10.50; No. 2 foundry, $10@$10.50; No. 3 foundry, $9.75@$10; No. 4 foundry, $9.25@$9.50; gray forge, $8.75@$9.25; No. 1 soft, $10.50; No. 2 soft, $10@$10.50.

A statement is made that certain brokers laid in a large supply of iron when prices were $9 and under, and that they are selling quite freely now, taking advantage already of the advance since March. The Sloss-Sheffield Steel & Iron Co. announced last week that it had sold at $10.25, and also at $10.50 per ton, No. 2 foundry, and that it was out of the market as far as some of the grades of iron go.

The steel plant at Ensley is still making a good output, notwithstanding difficulties with labor. The plant is turning out a large quantity of steel rails. The plant of the Alabama Steel & Wire Co., manufacturing steel rod, wire and nails, also at Ensley, is now in operation.

There is no change in the finished iron and steel market conditions, and the Bessemer and Gate City rolling mills are still in full operation. Cast-iron pipe makers report handsome orders in sight.

The big iron statue, "Vulcan," which will be placed on exhibition in the exposition at St. Louis, is being shipped in parts now from Birmingham. The statue will represent Birmingham and the great Birmingham district. Around the base will be a big display of minerals and finished products from the furnaces, mills and kindred plants in this section. The statue was molded in the Birmingham Steel & Iron Co.'s shop in this city. The plaster cast was made by Signor Moretti, a well known sculptor, who has been in Birmingham superintending the work for the past four weeks.

Chicago. April 18.

(*From Our Special Correspondent.*)

There are no signs of weakening in the pig iron market. The volume of sales continues good, and prices are firmly maintained. Southern has brought $10@$10.50 Birmingham, or $13.85@$14.35 Chicago, and northern holds well to the $14.50 mark. There are many large inquiries, and everything points to a steady maintenance of prices. Buyers continue to be reluctant to order much ahead of their immediate needs, but there are many sales running into the third quarter of the year. A year ago the average time ahead probably was eight or nine months. The tone of the local market, however, is slowly changing toward the old policy in this respect, and a gradual lengthening of the time is apparent.

Northern is in more demand than southern, considering the relative total business in each, the preponderance of trade being in southern. It is considered significant of good business conditions that the Steel Trust's furnaces in the Chicago district are again getting into blast generally. An upward climb in northern prices and volume of sales is predicted by sellers.

Coke is still abundant, and active work on the part of salesmen is necessary to save consignments from demurrage charges. The price is $4.90 on the bulk of sales, with a variation of 10c. either way.

Cleveland. April 19.

(*From Our Special Correspondent.*)

Iron Ore.—The situation has not changed much as far as the action of the Ore Association is concerned. No agreement has been reached as to prices, and it seems possible there will be no understanding for this year. It looks much now as if there would be a limited production, by a general understanding on that subject, but the output of the Lake Superior mines will not be as small as was at first suggested. The making of contracts between the Lake Carriers' Association and all of the labor unions permits the starting of vessels as soon as the channels between the upper and lower lakes are open.

Pig Iron.—The market has been quiet during the past week and indeed seems to bear out the prediction that there would not be as heavy selling during April as during March. New contracts are coming in rather slowly. This is accounted for in a measure by the fact that material available for delivery before July 1 has been sold up pretty well and the producers do not want to make contracts at current prices, for second-half delivery, until they know what the ore prices are to be. The absence of ore sales at any price, makes the pig iron situation past July 1 very questionable. The best indication for the present is that those who have contracts for first half delivery are requesting shipment regularly. The price holds about as it has been ranging from $13.25@$13.50 at the furnace. There is a little better call for basic, arising from increased consumption and limited output. The market is strong and $13.50 is about the established price, Valley basis. The call for bessemer is light.

Finished Material.—The market for structural has eased materially, and the call for new contracts is light. The demand for shipment on old contracts does not decrease. The demand for steel plates has been much lighter. Bars seem to hold their own and the trade is strong, with prices steady. There has been some sales of light rails. There has been a good call for sheets, but it is noted that the spring demand has not appeared, and some of the recent strength seems to have been lost. There is, however, a good demand for shipments on old contracts. The prices are still based on 2.50c. out of stock for No. 27 black sheets.

Old Material.—The market has been very dull, and the tendency of the market is downward.

New York. April 20.

Pig Iron.—The local market shows some improvement. Southern irons are firmer. We quote at tidewater as follows: No. 1 X foundry, $15.70; No. 2 X foundry, $15.20; No. 2 plain can be had for 50c. less; while gray forge is selling around $14.20. For Southern irons on dock quotations are: No. 1 foundry, $14.25@$14.50; No. 2 foundry, $13.75@$14; with lower grades in proportion. No. 1 soft can be had at about $14.25, and No. 2 soft at $13.75.

Bar Iron and Steel.—The trade is in satisfactory shape. Refined bars are quoted at 1.495c., in large lots, with steel at the same figures. Common iron bars can be had for 1.35c.

Plates.—There is no especial change in market conditions. Prices are firm. Sheared plates are quoted as follows: Tank, 1¼-in. and heavier, 1.75@1.85c.; flange, 1.85@2c.; marine, 2@2.10c.

Steel Rails.—The quotations remain $28 for standard sections, f. o. b. mills. Light rails are quoted f. o. b. eastern Pennsylvania mills as follows: 12-lb., $27; 20-lb., 25-lb., 30-lb., and 35-lb., $25; 40-lb. and 45-lb., $24.

Structural Material.—Conditions continue to improve and the outlook is much better than a few weeks ago. Large lots at tidewater are still quoted at 1.75@2c. for beams, angles and channels.

Philadelphia. April 20.

(*From Our Special Correspondent.*)

Pig Iron.—The heavy buying which has characterized the market for some time past has been followed, within a few days, by a period of dullness in the offices, but of activity at the furnaces. Much of the iron recently bought was wanted for quick delivery. Cars are scarce at some furnaces. The tone of the pig iron market is strong, and makers accept the recent business as evidence of continued activity in all kinds of pig. Within a day or two, additional inquiries have been received for basic, but there is an expectation of concessions, though agents give no encouragement of better prices. Most of our foundry consumers have as much iron as they care to contract for at present, but it would not be difficult to induce them to increase their takings by a moderate concession. Forge iron is very strong and quite a volume of business has been done this month. Quotations for early delivery are $16 for No. 1 X foundry and in two or three instances $16.25 was paid for special brands. A great deal more of No. 2 X would be taken as well as of No. 3 and No. 4 southern, but there seems to

be some hitch in the present negotiations. Standard gray forge shows a better front at $14 than it has shown for some time. Some sales were made within a day or two at $13. Basic pig is strong at $14.

Billets.—There is now nothing in the way, according to the views of mill agents, of the placing of large orders for steel millets. Our larger consumers are quite willing to do business and it is understood that some orders may be placed any day for delivery during the third quarter of the year. But it is intimated that special inducements have already been extended to those who contemplate buying so far ahead. Quotations $25, seaboard.

Bars.—Refined and special grades of bar iron met with good demand this week on a basis of 1.55c.; steel bars are also doing well, and the entire bar situation is satisfactory.

Sheet.—The sheet market is holding its own.

Boiler Tubes.—Representatives of boiler tube interests are elated over the fact that they have secured some large orders which have been hanging fire.

Merchant Pipe.—Several new enterprises are now before the market which will call for large quantities of merchant pipe.

Merchant Steel.—The kinds of merchant steel mostly used in this territory are meeting with good retail demand.

Plates.—The plate market is active so far as filling small orders goes. Quotations in small lots, 1.78½@1.93½c. up to No. 8 gauge. Some business has been done in commercial fire-box steel at 1.98½c.

Structural Material.—More business is being done in structural. The Pencoyd mill will soon be running, but it is impossible to obtain anything like a satisfactory statement as to the amount of business that has been secured. Beams, channels and angles are still quoted strong at 1.73½@1.85c.

Old Rails.—Parties are offering old iron rails at $19, but this figure here scares buyers away.

Scrap.—A good deal of scrap is now appearing on the market, the higher grades being held for more money than they will likely bring. No. 1 steel scrap is quoted to-day at $15.50@$16; choice railroad scrap is all cleaned up, but some good lots might be found if buyers were willing to pay $18. In the lower grades, such as wrought iron pipe, wrought turnings, cast borings, and No. 2 light scrap, we are doing a good business at steady prices.

Pittsburg. Apirl 19.

(*From Our Special Correspondent.*)

The failure of the United States Steel Corporation to exercise its option for 45,000 tons of bessemer pig iron for May delivery has evidently had an effect on the market. But little bessemer was sold during the week and only a few lots of foundry or forge iron. The furnaces, however, have all the orders they can possibly fill for April delivery and a large tonnage has been booked for shipment up to July 1. It is believed that the Corporation may yet take the iron. A representative of a large local interest expressed the opinion that the refusal of the minority ore producers to agree with the large producers on this season's prices had something to do with the pig iron purchase. It was stated that if the frequently postponed ore meeting is held to-day in New York as scheduled, and if the minority producers consent to the continuance of the association and the fixing of ore prices at a reduction of 50c., instead of $1 a ton, the Corporation may place a large order for pig iron. The opinion is expressed by others who are well informed on the situation that the Corporation will not buy any more iron, as it soon will be able to produce all of its requirements. It will have five or six new furnaces and furnaces that are being rebuilt in operation before July 1, and each will produce about 500 tons daily.

There has been some improvement in the demand for structural material, and the steel bar market is extremely active. There is but little doing in plates and billets, although prices are firm and the outlook is not at all discouraging. Buying of steel rails has stopped, for the present at least, and it is estimated that not more than one-half of the capacity of the rail mills is under contract for this year's delivery.

An agreement was finally reached on the sheet and tin-plate wage scales between the Amalgamated Association of Iron, Steel & Tin Workers and the American Sheet & Tin-Plate Co. and the independent interests. The manufacturers held out for a straight cut of 20% and the workers made several concessions. After a number of conferences had been held, the manufacturers receded from their position and consented to a cut of 18% from the scales of 1903-04. The workers agreed to accept the terms, provided a reduction was made in the base of the scales. This was arranged, and the base of the sheet scale was fixed at 2.30c. as the average selling price of Nos. 26, 27 and 28 gauges. The base had been 3c., but this was cut to 2.50c. when the 10% reduction went into effect on January 1. The base of the tin-plate scale was reduced to $3.40 a box for standard 100-lb. coke plates. This was a reduction from $4.20 a box. The workers in the sheet branch are to receive an increase of 2% with every 0.10c. advance in the average selling price and the tin-plate workers, under the provisions of the scale, will get an advance of 2% with every increase of 10c. a box above the base in the selling price. Sheets are selling about the base now and tin-plate is 5c. a box above the base. It is doubtful, however, that there will be any increases in wages during the life of the new agreement, which will expire on June 30. The American Co. yesterday started the South Sharon tin-plate plant in full, and is now operating 20 mills, 10 having been idle for eight months. The company now has all but two of its plants in operation. The Laughlin plant, at Martin's Ferry, O., is closed on account of a strike of the catchers, who refused to accept the 18% reduction. The catchers at the Steubenville plant of the Pope Tin-Plate Co. struck yesterday against the reduction and the works are closed.

It is understood here that the deal for the taking over of the steel plant and blast furnaces of the Clairton Steel Co. by the United States Steel Corporation will be concluded in New York to-day or to-morrow. Negotiations have been on for over a week and the terms were agreed to at a meeting of the directors of the Crucible Steel Co. of America yesterday afternoon.

Pig Iron.—The market is very quiet this week as to sales, but the furnaces are busy on orders, and there will be no accumulation of stocks this month. One sale of 1,000 tons and another of 500 tons of bessemer were made today. The price quoted is $13.50, Valley furnaces, for April shipment; but it is likely that this rate could be shaded for delivery during the rest of the second quarter. A few 100 and 200-ton lots of foundry No. 2 were sold at prices ranging from $14 to $14.50, Pittsburg. Gray forge is firm at $13@$13.25, Pittsburg, but little new business has been booked during the past week.

Steel.—The demand for steel bars and structural material is good, but the market for billets and sheet bars is very quiet. Prices of billets remain at $23, but premiums for prompt shipment have disappeared, and some shading is reported. Bars remain at 1.35c. and plates at 1.60c.

Sheets.—Instead of the expected advance in the price of sheets, lower quotations are said to have been made for desirable orders. It is reported that sales of No. 28 gauge black sheets have been made as low as 2.25c. Galvanized sheets are still quoted at 3.30c.

Ferro-Manganese.—The market is quiet and 80% domestic is still quoted at $42.50@$43.

Cartagena, Spain. April 2.

(*Special Report of Barrington & Holt.*)

Iron and Manganiferous Ores.—Shipments reported include three cargoes, 8,300 tons dry ore, to Great Britain. Shipments have been restricted on account of the holidays. Freight rates are low, 5s. 6d. having been taken to Rotterdam, 5s. 9d. to Glasgow and 6s. 6d. to Maryport.

Current quotations for iron ore are: Ordinary 50% ore, 6s. 6d.@6s. 9d.; special low phosphorus, 7s.@7s. 6d.; specular ore, 58% iron, 9s.; magnetic ore, 60%, 11s. 3d. for lumps and 9s. 3d. for smalls. Manganiferous ores range from 14s. 3d. for 20% iron and 20% manganese down to 9s. 6d. for 35% iron and 12% manganese.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s. 3d. per ton.

Other Exports.—Shipments included 41 tons copper to London and 55 tons copper matte to Hamburg.

CHEMICALS AND MINERALS.

New York, April 20.

Aside from the strength of raw materials, particularly nitrate of soda, the market generally is uninteresting, and prices show little variation from last week.

On May 18 the Virginia-Carolina Chemical Co. will vote on the cancellation of the floating debt incurred about a year ago, in lieu of which $6,000,000 in 8% preferred stock will be issued, making the total outstanding $8,000,000. Besides this there is $38,000,000 of common.

Cyanide.—Small exports to Mexico and Nova Scotia are noted. Imports are light just now. Quotations at New York continue 19@20c. per lb.

Bleaching Powder.—Quiet. Wholesale quotations continue at $1.25 per 100 lb. for prime domestic and British, and $1.20 for Continental.

Copper Sulphate.—Firm. Demand is moderate, and stocks light. New York prices are $5.20@$5.25 per 100 lb. for transient deliveries.

Acids.—Steady. Contract deliveries medium. We quote as below per 100 lb., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l.	$5.10@$5.50
Muriatic, 20°	1.60	Sulphuric, 50°,	
Muriatic, 22°	1.75	bulk, ton	13.50@14.50
Nitric, 36°	4.50	Sulphuric, 60°	1.05
Nitric, 38°	4.75	bulk, ton	18.00@20.00
Nitric, 40°	5.00	Sulphuric, 66°	1.20
Nitric, 42°	5.50	bulk, ton	21.00@23.00

Brimstone.—About a week ago 1,000 tons Japanese sulphur were sold in the New York market, which is surprising, as the ocean freight rate is nearly four times the Sicilian. Sicilian best unmixed seconds on spot are quoted at $22.75@$23 per ton, and for shipments at $21.75@$22. Best thirds are about 75c. less than seconds. It is rumored that Louisiana sulphur, which supplies part of the western demand, is to be introduced in the East. There is also a probability that Mexican sulphur, known back in 1876, will be marketed here in the near future.

Pyrites.—Spanish arrivals more frequent. Prices unchanged.

We quote domestic pyrites $5 per ton for lump ore, f. o. b. Atlantic coast mines, and 9c. per unit for fines; sulphur content varies from 42@44%. Spanish pyrites, carrying from 46@52% sulphur, are quoted at 11@11.5c. per unit for lump, and 9.5@10c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—A small lot sold on spot at $2.50 per 100 lb., but large consumers can get supplies from the next steamer due soon at $2.25. Futures are $2.10@$2.15, according to position.

The statistical position of nitrate of soda in Europe in March and the first quarter of this and last year, is shown below, in long tons:

		Three months.	
	March.	1904.	1903.
Exports to Europe	88,591	275,650	254,128
Imports	146,180	411,360	494,040
Deliveries	190,600	449,390	512,330

The visible supply on April 1 was 439,200 tons, which compares with 397,710 tons in 1903, showing an increase of 41,490 tons, or 10.4 per cent. The deliveries this year are 62,940 tons, or 11% less than 1903.

According to a despatch the Chilean Minister of the Interior has promised to investigate the labor situation in the nitrate of soda industry, and to frame equitable laws.

Propaganda expenses for the combination year from March 31, 1904, to April 1, 1905, are estimated at £34,000 ($165,040), of which £8,000 ($38,880) will be for America. This compares with £6,000 ($29,160) to be spent in Germany, and a like amount in France. In the fiscal year ended April 1, 1904, the propaganda expenses are believed to have totaled £36,021 ($175,078).

Estimates of the exports for the next fiscal year are already heard, and it is intimated that a further reduction in the individual quotas will be made, as there are no less than 94 oficiñas in the combination. Besides, consideration must be given to the purchasers of virgin mineral land last November, who paid $5,484,263 Chilean ($2,001,756 gold) for 15 plots in Tarapaca, originally appraised at $3,914,768 Chilean ($1,428,890 gold). The largest buyers were the Lagunas Syndicate, Lagunas Nitrate Co., Colorado Nitrate Co., S. y F. de Agua Santa Co. and the Barrenenechea Nitrate Co.

Sulphate of Ammonia.—Demand is purely retail. Gas liquor brings $3.15@$3.175 per 100 lb.

Phosphates.—There is a deadlock over future prices, because miners are not disposed to sell away into 1905 at the current low market, recognizing that the consumption of superphosphates is steadily increasing. It will be interesting to watch the movements of the European superphosphate manufacturers who are planning how to rehabilitate their own prices.

Exports of high-grade Florida rock from Savannah in March were 12,681 long tons, making 29,503 tons for the first quarter this year, which is somewhat less than 1903.

Tunis phosphate shipments in February were 32,196 metric tons, making 65,588 tons for the two months this year, as against 38,730 tons in the corresponding period of 1903. Most of these shipments were to France.

Ocean freights are firm, though charters have been comparatively few, as vessels are scarce.

	Shipping ports— Florida.	So. Carolina.	Africa.
Baltic	$3.46@$3.74	$2.26	2.18
Continental	2.76@ 3.00	....	1.80@ 2.22
Mediterranean	3.36@ 3.60	....	1.80
United Kingdom	2.64@ 3.12	2.56@ 2.64	1.86@ 2.04

Prices for phosphates are as follows per ton:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla. hard rock, 77@80%	$7.00@$7.25	$9.84@$10.83
land pebble, 68@73%	3.75@ 4.00	7.35@ 8.05
†Tenn, 78@80%	4.00@ 4.25	9.54@ 10.56
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
73@74%	2.95@ 3.20	.....
‡So. Car. land rock	3.25@ 3.50	.....
river rock, 55@60%	3.00@ 3.25	5.61@ 6.04
Algerian 63@70%	.....	6.82@ 7.32
58@63%	.....	6.05@ 6.50
53@58%	.....	4.95@ 5.09
Tunis (Gafsa)	.....	5.75@ 6.50
Christmas Isle, 80@85%	.....	11.75@ 12.54
Ocean Isle, 82@88%	.....	12.54@ 12.98
Somme, Fr., 70@75%	.....	10.63@ 11.02
Bordeaux, Fr., 60@65%	.....	7.60@ 7.72
55@60%	.....	6.44@ 6.55
Liege, Bel., 60@65%	.....	7.00@ 7.10

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

Liverpool. April 6.

(*Special Report of Joseph P. Brunner & Co.*)

While there is no activity in the demand for heavy chemicals, there is a quiet undercurrent of business passing at steady prices.

Soda ash.—For tierces, nearest values are as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in moderate demand at £3 7s. d. per ton, less 5% for barrels, or 7s. less for bags: with special terms for a few favored markets. Caustic soda is firm as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export quarters. Bleaching powder is in better request, at £4 5s.@£4 10s. per ton, net cash, for hardwood casks, as to market. Chlorate of potash is still dull at about 2⅜d.@2½d. per lb., net cash, for English make. Bicarbonate of soda is held for £6 15s. per ton, less 2.5%, for the finest quality in 1 cwt. kegs, with usual allowances for larger packages, also special terms for a few favored markets. Sulphate of ammonia is without change and moving off quietly at £12 15s.@£12 16s. 3d. per ton, less 2.5% for good gray, 24@25% in double bags f. o. b. here. Nitrate of soda is well maintained on spot at £10 7s. 6d.@£10 12s. 6d. per ton, less 2.5% for double bags, f. o. b. here, as to quantity and quality.

METAL MARKET.

New York, April 20.

Gold and Silver Exports and Imports,

At all United States Ports in March and Year.

Metal	March. 1903.	March. 1904.	Year. 1903.	Year. 1904.
Gold:				
Exports.	$1,042,598	$3,062,747	$2,634,919	$4,386,928
Imports.	4,567,728	8,855,760	8,396,035	22,115,640
Excess	I. $3,525,130	I. $5,793,013	I. $5,761,116	I. $17,728,712
Silver:				
Exports.	3,664,660	4,110,053	11,109,045	12,675,249
Imports.	1,478,771	2,108,386	4,660,334	6,824,403
Excess	E. $2,185,889	E. $2,001,667	E. $6,448,711	E. $5,850,84

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending April 16 and for years from January 1.

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.
Week	$561,803	$24,431	$485,223	$3,081
1904	6,745,095	1,581,354	13,496,640	210,742
1903	1,347,450	2,516,892	5,620,795	375,613
1902	16,419,384	1,014,343	10,057,324	424,332

The gold shipped was principally for France; the silver for London. Imports of both gold and silver thus far this year are considerably less than 1903; but exports show a substantial increase.

Business remains rather quiet, except in a few special lines. The speculative markets are still depressed. Gold to the amount of $1,500,000 is reported taken for export to France.

The value of merchandise exports from the United States, as given by the Bureau of Statistics of the Department of Commerce and Labor, in the month of March, was $1,013,215 greater than in February, but $12,280,494 less than in March, 1903. For the three months ending March 31 the statement is as follows:

	1903.	1904.
Exports	$391,672,657	$380,658,895
Imports	264,027,489	262,715,641
Excess, exports	$127,645,168	$117,943,254
Add excess of exports, silver	.....	5,850,846
Total	.....	$123,794,100
Deduct excess of imports, gold	.....	17,728,712
Balance of exports	.....	$106,065,388

The gold and silver exports in detail will be found in the usual place, at the head of this column.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

N. Y. Ass'd—	1903. Gold.	1903. Silver.	1904. Gold.	1904. Silver.
	$160,972,500	.....	$228,746,000	.....
England—	168,623,535	.....	170,295,300	.....
France—	499,915,975	$219,646,049	474,746,300	$222,427,595
Germany—	156,180,000	54,875,000	157,790,000	55,440,000
Spain—	72,355,000	101,005,000	73,280,000	98,560,000
Netherlands—	19,676,500	32,615,000	27,212,500	32,660,000
Belgium—	15,546,665	7,773,335	15,696,665	7,848,335
Italy—	88,575,000	11,369,500	110,360,000	19,054,000
Russia—	382,170,000	41,815,000	434,190,000	41,825,000
Austria—	229,210,000	66,955,000	236,275,000	64,335,000

The returns of the Associated Banks of New York are of date of April 16, and the others April 13, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending April 16, gives the following totals, comparisons being made with the corresponding week of 1903:

	1903.	1904.
Loans and discounts	$905,207,300	$1,043,254,100
Deposits	887,290,200	1,097,118,400
Circulation	43,495,000	35,314,200
Specie	160,972,500	228,746,000
Legal tenders	66,857,700	72,838,200
Total reserve	$227,830,200	$301,584,200
Legal requirements	221,822,550	274,279,600
Balance surplus	$6,007,650	$27,304,600

Changes for the week were increases of $4,721,100 in loans and discounts, $11,605,600 in deposits, $5,644,600 in specie, $1,645,000 in legal tenders, and $4,388,200 in surplus reserve, a decrease of $308,600 in circulation.

Silver, after declining to 24 7-16d., has shown some firmness and disposition to improve. The execution of any large orders would certainly tend to stiffen the price. To-day sales are made at 24 13-16d. in London.

The United States Assay Office in New York reports receipts of 121,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to April 7 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.	Changes.
India	£2,193,500	£3,434,589	I. £1,241,089
China	121,775	71,000	D. 50,775
Straits	136,391	58,103	D. 78,288
Total	£2,451,666	£3,563,692	I. £1,112,026

Receipts for the week this year were £214,000 in bar silver from New York, £8,000 from the West Indies, £3,000 from Chile, and £2,000 from Australia, total £227,000. Shipments were £115,750 in bar silver to India.

Indian exchange has been somewhat easier, the demand for money in the presidencies having fallen off somewhat. The Council bills offered in London, however, were all taken at an average of 16.03d. per rupee. Demand for silver on Indian account still continues rather light.

The movement of gold in Germany for the full year is reported as follows, in marks—23.8c. each:

	1902.	1903.	Changes.
Imports—	M. 138,900,000	M. 280,700,000	I. M. 141,800,000
Exports—	106,000,000	91,600,000	D. 14,400,000
Ex., imp.—	M. 32,900,000	M. 189,100,000	I. M. 156,200,000

The imports in 1903 included 116,400,000 marks in coin and 164,300,000 marks in bars, ingots, etc. Of the exports 27,400,000 marks were in coin, and 64,200,000 marks in bars and ingots.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.43	$0.46
Peruvian soles and Chinese pesos	.39	.41
Victoria sovereigns	4.85⅛	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

April	Silver— New York, Cts.	Silver— London, Pence.	Copper— Lake, Cts. per lb.	Copper— Electrolytic, Cts. per lb.	Copper— London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter— N. Y., Cts. per lb.	Spelter— St. Louis, Cts. per lb.
14	53⅜	24⅝	13 @13¼	12⅞ @13	57⅞	28⅛	4.45 @4 50	5.22½	5.05
15	52⅞	24 7/16	13 @13¼	12⅞ @13	58	28⅛	4.45 @4.50	5.22½	5.05
16	53⅛	24½	13 @13¼	12⅞ @13	....	28⅛	4.45 @4.50	5.22½	5.05
18	53⅛	24¾	13 @13¼	12⅞ @13	58½	28⅛	4.45 @4.50	5.22½	5.05
19	53⅜	24⅝	13 @13⅛	12⅞ @13	58	28	4.45 @4.50	5.22½	5.05
20	53⅞	24 11/16	13 @13¼	12⅞ @13	57 11/16	28@ 28⅛	4.45 @4 50	5.22½	5.05

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures

QUOTATIONS ON STERLING EXCHANGE.

April	14.....	4.87¼	April	18.....	4.87¼
"	15.....	4.87¼	"	19.....	4.8735
"	16.....	4.87¼	"	20.....	4.8745

Copper.—During the week under review the market has been rather dull, without any special feature, though consumers show somewhat more interest in later deliveries. In view of the cold weather prevailing, it is feared that lake navigation will not open as early as was expected. The closing quotations are given as 13@13¼ for lake; 12⅞@13c. for electrolytic in ingots, cakes and wirebars, 12⅝@12¾ in cathodes; 12½@12⅝c. for casting copper.

The market for standard copper, which closed last week at £58, has ruled steady at about this figure, and the closing quotations on Wednesday are cabled as £57 17s. 6d@£57 18s. 9d. or spot, £57 13s. 9d.@£57 15s. for three months.

Statistics for the first half of April show an increase in the visible supplies of 700 tons.

Refined and manufactured sorts we quote: English tough, £62@£62 5s.; best selected, £62 10s.@£62 15s.; strong sheets, £72 15s.@£73; India sheets, £70 15s.@£71; yellow metal, 6⅝@6½d.

Exports of copper from Baltimore for the week ending April 19 were 941 tons to Germany, Belgium and Great Britain.

Tin has been in good demand throughout the week, especially for early delivery, while futures are still rather neglected. Otherwise there is no special feature in the market. The closing quotations are 28@28⅛c. for spot and futures.

The foreign market, which closed last week at £128 7s. 6d., opened on Monday at £127 15s., declined on Tuesday to £126 10s., and the closing quotations on Wednesday are cabled as £127@£127 2s. 6d. for spot, £126 15s.@£126 16s. 3d. for three months.

Lead is quiet but steady without any special feature. The closing quotations are given as 4.45@4.50 New York, 4.37½@4.42½ St. Louis.

The foreign market, which at one time was as low as £11 2s. 6d., closes somewhat firmer, the price for Spanish lead being quoted as £12 3s. 9d.@£12 6s. 3d. English lead, £12 6s. 3d. @£12 8s. 9d.

St. Louis Lead Market.—The John Wahl Commission Company telegraphs us as follows: Lead is firm but quiet. Quotations are 4.40c. for Missouri brands and 4.42c. for argentiferous lead.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 2, that the price of silver during the week has been 14.25 reales per oz. Exchange is 35 pesetas to £1. Local quotation for pig lead has been 70 reales per quintal, which, on current exchange, is equal to £11 12s. 9d. per long ton, f. o. b. Cartagena. Exports were 101,400 kg. desilverized and 39,840 kg. pig lead to Marseilles.

Spelter has ruled rather dull throughout the week and there is nothing of special interest to report. The ruling quotations are 5.05 St. Louis, 5.22½ New York.

The foreign market remains firm, good ordinaries being quoted at £22 7s. 6d., specials £22 12s. 6d.

St. Louis Spelter Market.—The John Wahl Commission Company telegraphs us as follows: Spelter is strong at 5.10c. East St. Louis. Offerings continue light and the tendency seems to be upward.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 2, that prices have ruled very firm, and miners are well satisfied. Quotations continue 65 fr. per ton blende, 35% zinc, and 45 fr. for calamine, 30% zinc. Exports for the week were 700 tons blende to Antwerp and 100 tons to Hamburg.

Antimony is in somewhat better demand. We quote Cookson's at 7¾@8c.; Hallett's, 6⅝@ 6⅞c.; U. S., French, Italian, Japanese and Chinese, 6⅜@6½c.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Demand continues steady, and the price is firm at $18.50 per oz.

Messrs Eimer & Amend, of New York, inform us that prices for platinum in manufactured forms have been considerably increased, in consequence of the causes already noted in the JOURNAL. They quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 77c.; crucibles and dishes, 80c.; perforated ware, like cones, etc., 85c. per gram.

Quicksilver.—The New York price is $45 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders, and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Cadmium.—According to Herr Paul Speier, metallic cadmium is in good demand. Metal containing 95.5% cadmium sells at 700 marks per 100 kg., delivered in Berlin or Hamburg.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Aluminum	Per lb		Per lb
No. 1. 98% ingots	33@37c.	Ferro-Tungsten (37%)	38c.
No. 2. 90% ingots	31@34c.	Magnesium, pure (N. Y.)	60c.
Rolled Sheets	4c. up	Manganese	$2.75
Alum-bronze	20@23c.	Mangan'e Cop. (20% Mn)	32c.
Nickel-alum	34@39c.	Mangan'e Cop. (30% Mn)	38c.
Bismuth	$2.10	Molybdenum (Best)	$2.00
Chromium, pure (N. Y.)	80c.	Phosphorus, foreign	45c.
Copper, red oxide	50c.	Phosphorus, American	70c.
Ferro-Molybde'm (50%)	$1.25	Sodium metal	50c
Ferro-Titanium (10%)	90c.	Tungsten (Best)	88c.
Ferro-Titanium (20@25%) N. Y.	55c.		

Variations in price depend chiefly on size of order.

Missouri Ore Market. April 16.

(From Our Special Correspondent.)

The highest price reported paid for zinc ore was $39.50 per ton and the assay basis is reported at $34 to $37 per ton of 60% zinc. An effort on the part of three of the purchasing agencies to lower prices was met by some of the other agencies with offers on the ore cut in price the same as was paid the previous week; consequently what promised early in the week to result in a general reduction of $1 per ton on zinc concentrates amounted to almost a fiasco sa far as price cutting was concerned. A few sellers let their ore go at a less price on the first announcement of the cut, but members of the Missouri & Kansas Zinc Miners' Association, who are in close touch with the general market conditions, reaped the benefit of this knowledge by selling slow and getting in on the reactionary offerings. The reserve stock has been increased during the past six weeks, but it is now only about 4,500 tons, largely sold but not delivered; the aim of the buyers being to create the appearance of a larger reserve than there really is, were all the purchased ore shipped. The market price of lead continues unchanged at $58 per ton, with premiums on extra grade of ore.

Following are the shipments of zinc and lead ore, in pounds, from the various camps of the district for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin	3,161,540	366,440	$67,170
Webb City-Carterville	1,854,610	359,430	39,740
Duenweg	1,069,210	97,910	21,985
Galena-Empire	816,100	173,360	17,265
Alba-Neck	821,210	.....	14,780
Granby	930,000	36,000	14,595
Aurora	461,950	2,160	7,885
Oronogo	355,110	8,600	5,890
Prosperity	285,150	.....	4,990
Mitchell	236,000	.....	4,600
Badger	199,880	.....	3,600
Cave Springs	183,110	13,620	3,510
Zincite	152,920	.....	2,750
Carthage	127,650	.....	2,300
Beef Branch	42,410	89,770	2,355
Carl Junction	55,400	13,950	1,415
Central City	17,220	15,010	675
Spurgeon	42,270	6,140	515
Totals	10,811,740	1,182,390	$216,020
16 weeks	162,340,830	20,257,020	$3,279,920

Zinc value, the week, $183,435; 16 weeks, $2,713,240.
Lead value, the week, 32,585; 16 weeks, 566,680.

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903	1904.	1903.	1904.	1903.	1904.
Jan...	28.33	28.845	4.075	4.347	4.865	4.863
Feb..	29.43	28.087	4.075	4.375	5.043	4.916
Mar..	30.15	28.317	4.442	4.475	5.349	5.057
April.	29.81	.....	4.567	.....	5.550	....
May..	29.51	.....	4.325	.....	5.639	....
June..	28.34	.....	4.210	.....	5.697	....
July..	27.68	.....	4.075	.....	5.662	....
Aug..	28.29	.....	4.075	.....	5.725	....
Sept..	26.77	.....	4.243	.....	5.686	....
Oct...	25.92	.....	4.375	.....	5.510	....
Nov..	25.42	.....	4.218	.....	5.338	....
Dec...	27.41	.....	4.162	.....	4.731	....
Year	28.09	.....	4.237	.....	5.400	....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.; February 4.717c.; March, 4.841c.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan...	12.159	12.410	12.361	12.553	53.52	57.55
Feb...	12.778	12.063	12.901	12.245	57.34	56.57
Mar..	14.416	12.299	14.572	12.551	63 85	57.321
April.	14.454	.....	14.642	.....	61.72	.....
May..	14.435	.....	14.618	.....	61.73	.....
June..	13.942	.....	14.212	.....	57.30	.....
July..	13.094	.....	13.341	.....	56.64	.....
Aug..	12.962	.....	13.159	.....	58.44	.....
Sept..	13.205	.....	13.345	.....	56.82	.....
Oct...	12.801	.....	12.954	.....	55 00	.....
Nov..	12.617	.....	12.813	.....	56.30	.....
Dec..	11.952	.....	12.084	.....	56.36	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London, Pence.	N. Y., Cents.	London Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan..	25.62	55.56	21.98	47.57	26 423	57.055
Feb..	25.41	55.09	22.11	47.89	26.665	57.592
Mar..	25.00	54.23	22.49	48.72	26,164	56,741
April.	24.34	52.72	23.38	50.56	.....	.....
May..	23.71	51.31	24.89	54.11	.....	.....
June.	24.17	52.36	24.29	52.86	.....	.....
July..	24.38	52.88	24.86	53.92	.....	.....
Aug..	24.23	52.52	25.63	55.36	.....	.....
Sept..	23.88	51.52	26.75	58.00	.....	.....
Oct...	23.40	50.57	27.89	60.36	.....	.....
Nov..	22.70	49.07	27.01	58.11	.....	.....
Dec...	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.57	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

DIVIDENDS.

Company.	Latest Dividend. Payable.	Rate.	Total.	Total to date.
‡Anaconda Copper	May 19	.50	600,000	23,850,000
Camp Bird, Colo.	May 7	.18	147,600	1,262,904
Central Eureka, Cal.	Apr. 14	.03	11,953	271,853
†Central Oil, W.Va.	May 2	.25	15,000	182,500
†Col.&Hock., C.&I.	May 15	.25	17,311	121,153
*El Paso, Colo.	Apr. 25	.01	24,500	157,545
*Homestake, S. D.	Apr. 25	.25	54,600	12,856,150
Montana Ore Purch.	Apr. 30	4.00	324,000	3,618,000
Oil City Petrol., Cal.	May 2	.00½	2,500	5,000
‡Penna. Steel, pf.	May 2	3.50	588,749	4,094,499
†Pittsburg Coal, pf.	Apr. 25	1.75	519,771	9,355,878
†Portland, Colo.	Apr. 25	.06	180,000	5,017,080
So. Swansea, Utah.	Apr. 25	.01	3,000	170,500
‡United Copper, pf.	May 2	3.00	150,000	600,000
*Utah (Fish Spr'gs)	Apr. 25	.01	1,000	223.000
†Vindicator, Colo.	Apr. 25	.03	33,000	1,148,000

* Monthly. † Quarterly. ‡ Semi-annually.

ASSESSMENTS.

Company.	Delinquent.	Sale.	Amount.
Alpha, Nev.	May 9	June 1	.05
Belcher, Nev.	Apr. 13	May 5	.10
Chollar, Nev.	Apr. 12	May 3	.10
Confidence, Nev.	Apr. 20	May 11	.20
Con. Imperial, Nev.	Apr. 14	May 9	01
Crown Point, Nev.	Apr. 27	May 18	.10
Justice, Nev.	Apr. 22	May 11	.10
Overman, Nev.	Apr. 12	May 3	.10
Union Con., Nev.	Apr. 19	May 9	.15

STOCK QUOTATIONS

NEW YORK.

Company.	Par val.	Apr.13 H.	Apr.13 L.	Apr.14 H.	Apr.14 L.	Apr.15 H.	Apr.15 L.	Apr.16 H.	Apr.16 L.	Apr.18 H.	Apr.18 L.	Apr.19 H.	Apr.19 L.	Sales.
Acacia	$1													
Amalgamated, c.	100	50⅛	49¾	50⅝	49⅛	49⅞	48⅞	49⅞	49⅝	50¼	49⅛	50	49⅛	85,434
Anaconda, c.	25	78¾	78	76	73	74	72			74	70	73		1,550
Anaconda, g.												12		500
Andes, s.	1			32										500
Belcher, s.	3													
Best & Belcher, s.	3			2.25										100
Breece, s. l.	25													
Bullion, s.	1							17						500
Caledonia, s.	1					90								100
Challenge, s.	2½	24												300
Chollar, s., g.	2½	25	24							25		24	23	800
Chrysolite, s. l.	50													
C. K. & N., g.	1			19										1,000
Confidence	3											95		160
Con. Cal. & Va., g. s.	2½			1.65		1.65		1.65				1.65		670
Con. Imperial, s.	1	.03½		.03½				.04						2,500
Creede & C. Ck., g.	1													
Cripple Creek, g.	1	.07		.07				.07		.07		.07		4,300
Crown Point	2½													
Daly, g. s.	20													
Elkton, g.	1	.65				66								400
El Paso, g	1													
Gold Dollar, g.	1													
Gould & Curry	1													
Greene Con., c.	10	15⅝	15¼	15⅞	13½	15	14¼	15⅛	14¾	14⅝	14½	14⅝	14⅜	22,485
Hale & Norcross	3													
Homestake, g.	100									50				20
Horn Silver	20													
Isabella, g.	1									28		30		1,500
Jack Pot, g.	1													
Little Chief, g. s.	50			06										100
Mexican, s.	3			2.10						2.00		2.10		400
Mollie Gibson, g.	5	05												500
Moon Anchor, q.	5					10	9							1,000
Occidental, s.	3			85	84									200
Ontario, s. l.	100													
Ophir, s.	3					500								100
Overman, s.	2							38						300
Pharmacist, g.	1													
Phœnix, g.	1	15	12	13	12	12				12		12	11	10,800
Portland, g.	1	1.80		1.80		1.85								100
Potosi, s.	1					20				23	22	23		1,100
Quicksilver, Pf.	100													
Savage, s.	3	43				48		49	48					500
Sierra Nevada, s.	3									68	67			500
Silver Hill, g. s.	10									67				100
StandardCon., g. s.	25					2.05								100
Tennessee, c.	1													
Union Con., g. s.	10									90				300
Union Copper	100	⅞		⅞		⅞		⅞		⅞	¾	¾	⅞	1,940
United, com., c.														
Vindicator														
White Knob, c.	10	8¾		8¼	8							8	7¾	550
Work, g.	1			7		6		3		6				2,800
Yellow Jacket, s.	3													

c—Copper. g—Gold. l—Lead. s—Silver. Total sales, 143,949 shares *Holiday.

BOSTON, MASS.

Company.	Par val	Apr.13 H.	Apr.13 L.	Apr.14 H.	Apr.14 L.	Apr.15 H.	Apr.15 L.	Apr.16 H.	Apr.16 L.	Apr.18 H.	Apr.18 L.	Apr.19* H.	Apr.19* L.	Sales.
AdventureCon., c	$25	4⅞	4¾	2½	2¼	2¼				2¼	2			665
Allouez, c.	25			4¾		4⅝	4¾	4¾	4⅝	5	4⅝			572
Amalgamated, c.	100	50⅜	49⅝	50½	49⅛	49⅝	49	49⅞	49⅜	50¼	49¼			15,899
Am. Z., L. & Sm.	25	11								11				50
Anaconda, c. s.	25													
Arcadian, c.	25							45						100
Arnold, c.	25			25										50
Atlantic, c.	25	8¼				8				8½				185
Bingham Con.	50	23	22¾	23	22¼	22½	22			22⅜	22			998
Bonanza Dev. g.	10					50								50
British Col., c.	5													
Calumet & Hecla	25			468	463	465		469	468	470	468			52
Centennial, c.	25	20½	20¼	20⅛	19½	20	19¼	20		20				1,880
Central Oil	25	7½												50
Con. Mercur, g.	5	53	51	50		50		50		50	45			2,600
Continental Zinc														
Copper Range	100	43½	42⅜	43⅛	42⅛	42½	41¾	42½	42	42⅜	42			3,774
Daly West, g. s. l	20	23½	22¾	22½	20⅜	22	20½	22½	21¾	22¼	21			7,357
†Dominion Coal	100	64	63½	63¾		63		63		62¾	61⅝			255
Preferred	100													
Dominion I. & S.	100	10⅜	10	10¼	10	10¼								500
Elm River, c.	12					2⅜		2¼						550
Franklin, c.	25	8⅛	7⅞	7⅞	7⅝			7⅞		8				355
Granby Con.	10	3½		3½				3½	3¼					1,800
Guanajuato Con.	5	1⅜	1 5/16	1 7/16	1⅜	1⅜	1½							1,125
Isle Royal Con.	25			7½		7⅛								115
Mass Con., c.	25	4 1/16				4¼	4	4¼	4 1/16	4				295
Mayflower, c.	25													
Michigan, c.	25	5								5½				300
Mohawk, c.	25	42¾	42	42½	41	41½	41⅛			41½	41			1,605
Mont. Coal & C.	25					2¼								100
Mont'l & Boston.	5	72⅛	68¾							82	70			400
Napa, Cons., q.	7				50									150
New Idria, q.	5													
Nova Scotia St.	100													
Preferred	100													
Old Colony, c.	25									75				6
Old Dominion, c.	25			12¼				12½		13	12¼			305
Osceola, c.	25	58¾	58½	58¾		57½		57⅝	57½	58	57⅜			315
Parrot, s. c.	10	25¼		24¾	24½	24		24		24	23½			495
Phœnix Con, c.	25			2				2						55
Quincy, c.	25			87		85				85				78
Rhode Island, c.	25	1 1/16		1		1								200
Santa Fe, g. c.	10	1⅝												10
Shannon, c.	10	8½	8⅜	8⅝	8	8¼		8¼		8⅜				385
Tamarack, c.	25	95		95										17
Tecumseh, c.	25													
Tennessee, c.	25													
Trinity, c.	25	4½	4			4½	4	4⅜	4					1,375
Union, c.	25													
United States, g.	10	20¾	20⅝	20⅞	20½	20¾	20⅝	20⅝	20½	20½	20⅜			1,920
U. S. Coal & Oil	25	9⅝				9½	9¼	9⅝		9½	9⅜			701
Utah Con., g. c.	5	33⅜	33½	34	33⅛	33½	33¼	33¾	33⅛	34⅛	33½			2,119
Victoria, c.	25	3¼		3⅜				3¼		3¼	3			303
Winona, c.	25			6½				6¾	6½					953
Wolverine, c.	25	72		72		72		72¼		73	72¼			98
Wyandot, c.	25	75		75		75								435

*Holiday. †Ex-dividend. ‡Assessment Paid. Total sales, 51,577 shares.
c—Copper g—Gold. l—Lead. q—Quicksilver. s—Silver.

Duluth, Minn.

Company	Par Val.	Bid.	Asked.	Company	Par Val.	Bid.	Asked.
Calumet & Arizona	$10	$110	$111	Lake Sup. & Pitts Dev.	$10	$130	$135
Calumet & Bisbee	10	7.50	8.00	Pitts. & Duluth Dev.	15	50.00	51.00
Calumet & Cochise	10	7.50	8.00	Shakespeare			.20
Calumet & Pittsburg	10	33.50	35.00	United Mexican			.50
Higgins Development	10	3.00		Wolverine & Arizona	10	4.00	
Junction Development	15	14.00	14.50	Yaqui	10		1.50

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Apr.13 H.	Apr.13 L.	Apr.14 H.	Apr.14 L.	Apr.15 H.	Apr.15 L.	Apr.16 H.	Apr.16 L.	Apr. 18 H.	Apr. 18 L.	Apr. 19 H.	Apr. 19 L.	Sales
Allis-Chalmers	$100											7		100
Preferred	100													
Am. Agr. Chem	100			13								13½		400
Preferred	100													
Am. Sm. & Ref.	100	48⅛	48¼	48¾		48		48⅝	48⅜	48⅜	48⅛	48		2,010
Preferred	100	93¾	93	93⅝	93½			93⅝		93¾	93¼	92¾	92½	1,804
Col. Fuel & I.	100	33	32	32	31⅝	31½	31¼	32½		32	31¾	31½	31	2,474
Preferred	10													
Col. & H. C. & I.	100	13		13½										200
*Crucible Steel	100	4⅞	4¾	5⅝	4⅞	5¾	5⅛	5½		6	5½	5⅜	5⅜	6,542
*Preferred	100	32¼	32	35⅞	32½	36⅜	36½	36½	36	45	36⅜	43¼	40	11,632
General Chem.	100													
Preferred	100													
*Mong. R. Coal	50			8								8		25
*Preferred	100	25¾				26		26	25¾	26	25¾	26		560
National Lead	100	17⅞	17⅝	18⅜	17¾	18⅜	18⅛	18	17½	17¾	17⅜	17⅜	17⅛	15,770
Preferred	100	89		91	90					89				780
*Phila. Nat. Gas.	100	38½								38½				200
*Preferred	100													
*Pittsburg Coal	100	17⅜	17	16¼						16¼		16		375
*Preferred	100	62½	61¾	61⅜	59¼	59⅝	59½	59	58⅜	59	58¾	59	58½	3,575
Republic I. & S.	100	7⅝	7½	7½		7½		7½		7½		7¼	7⅛	1,900
Preferred	100	46⅝	46	46¼		46¾	46			45½		46	45¾	1,127
Sloss-Sheff S. & I.	100	40½	40¼	39⅝	39⅜					40¾	40	39¾		500
Preferred	100													
‡Standard Oil	100					631	630	630		631	627			25
Tenn. C. I. & R. R.	100	39¼	39⅜			39¼	38½	39¼		39⅛	38¼	38¼		4,895
U. S. Red. & Ref.	100													
Preferred	100													
U. S. Steel Corp.	100	11⅛	11¼	11⅛	11¼	11⅜	11⅛	11⅜	11¼	11¼	11¼	11⅜	10⅞	30,762
Preferred	100	61⅞	60½	61⅜	60⅜	60¾	60¼	60⅝	60⅜	61⅛	60½	60	57¾	152,755
Va.-Car Chem.	100	29		28½	26½	26½	25½	25½	23½	25½	24¼			10,985
Preferred	100			101⅞				97⅝		98⅛	95⅜			538

*Pittsburg exchanges. †Holiday. ‡Ex. dividend. Total sales, 250,024.

COLORADO SPRINGS, COLO.

Company.	Par Val	Apr. 9 H.	Apr. 9 L.	Apr.11 H.	Apr.11 L.	Apr.12 H.	Apr.12 L.	Apr.13 H.	Apr.13 L.	Apr.14 H.	Apr.14 L.	Apr.15 H.	Apr.15 L.	Sales
Acacia	$1	.06¾	.06¼	.06⅞	.06½	.06½	.06	.05¼	.06	.06¾	.06	.07	.06¼	3,000
American Con.	1													
Anaconda	5	.13	.11	.13	.11	.13	.11	.13	.11½	.13	.11			
Colo. City & M.	1	.02⅝	.02⅜	.02¾	.02⅜	.02⅝	.02¼	.02⅜	.02⅜	.02¾	.02⅜	.02¾	.02¼	
C. K. & N.	1	.25	.22	.21½		.24	.22	.23½	.22½	.25	.23	.26	.24	2,000
Cripple Ck. Con.	1	.07½	.07¼	.07½	.07⅜	.08	.07¼	.07½	.07⅜	.07⅜	.07⅜	.07⅜	.07⅜	15,000
Des Moines	1	.02½	.02	.02½	.02	.02¼	.02	.02⅜	.02	.02⅜	.02	.02⅝	.01¾	2,000
Doctor Jack Pot	1	.07¼	.06½	.07½	.06¾	.07	.06	.06½	.06	.07	.06¾	.07	.06½	5,000
Elkton Con.	1	.67	.66	.67	.66¾	.66¾	.66½	.67	.66½	.66⅝	.66	.67	.66	10,625
El Paso	1	.79	.78½	.80	.79½	.80	.79¾	.80	.79½	.80	.79⅝	.80	.78¼	27,216
Gold Dollar Con.	1	.05½	.05	.05¼	.05	.05⅝	.05	.05¼	.05	.05¼	.05⅛	.05¼	.05⅛	18,650
Gold Sovereign	1	.04¾	.04⅜	.04¼	.04	.04⅜	.04	.04¼	.04⅛	.04½	.04⅜	.04⅜	.04⅛	9,000
Golden Cycle	1	.50	.44½	.50	.43½	.48½	.43½	.50	.45	.50	.45	.50	.45	
Golden Fleece	1	.02		.02		.02		.02		.02		.02		
Hart	1	.02		.03	.02	.03	.02	.03	.02	.03	.02	.03	.02	
Isabella new	1	.29	.28	.29½	.28	.29	.28	.30	.28¼	.29	.28	.29	.28	600
Jack Pot	1	.05		.05		.05		.09	.06	.09	.05	.09	.05	500
Keystone	1	.03⅞	.03½	.04	.03½	.04	.03¾	.04	.03½	.04	.03⅝	.04	.03⅝	2,000
Last Dollar	1	.45		.45		.45		.45		.45		.45		
Lexington	1	.04⅛	.03⅞	.04⅛	.03⅞	.04⅛	.03⅞	.04⅛	.03⅞	.04	.04	.04⅛	.03⅞	1,000
Little Puck	1	.03⅛	.03⅜	.03⅛	.03⅜	.03⅛	.03¼	.03⅛	.03¼	.03⅜	.03¼	.03½	.03¾	6,000
Mollie Gibson	1	.05½	.05	.05		.05½	.04½	.05½	.04¾	.05½	.05	.05½	.05⅛	3,100
Moon-Anchor	5	.09	.07	.09	.07½	.09	.07½	.09	.07½	.09	.07½	.09	.07½	500
New Haven	5	.02¾	.02½	.03⅛	.02¾	.03¼	.02¾	.03¼	.02¾	.02¾	....	.03½	.02⅞	16,000
Old Gold	1	.10¾	.09¾	.10½	.10	.11¼	.10¾	.11⅜	.10½	.11½	.11	.11½	.10⅝	2,000
Pharmacist	1	.03⅝	.03¼	.039⅝	.03¾	.03⅞	.03½	.03⅝	.03½	.03¾	.03½	.03¾	.03½	1,000
Pinnacle	1	.03⅛		.03½		.03½		.03⅝		.03½		.03½		
Portland	1	1.75	1.51	1.81	1.70	1.80	1.71	1.75	1.70½	1.80	1.70	1.78	1.69	2,000
Vindicator Con.	1	.65		.80	.70	.75	.70	.75	.70	.75	.71	.74	.70	1,000
Work	1	.06⅛	.06¼	.07	.06⅞	.07⅜	.06⅜	.07	.06¾	.07¼	.06⅝	.07¼	.07	
														11,000

*Quotations not received. Total sales, 139,191 shares.

COLORADO SPRINGS (By Telegraph).

Company.	Apr. 18 H.	Apr. 18 L.	Apr. 19 H.	Apr. 19 L.
Anaconda	.13	.11	.12⅛	.11¾
Cripple Ck Con.	.07½	.07¼	.07⅝	.07⅜
C. K. & N.	.26	.24	.25	.24
Doctor-Jack Pot.	.05	.04⅞	.05⅛	.04¾
Elkton Con	.66¾	.66	.66⅞	.66⅝
El Paso	.79¼	.79	.80	.79½
Gold Dollar Con.	.05⅜	.05¼	.05⅛	.05⅛
Gold Sovereign	.05⅛	.07	.06⅛	.06
Isabella	.30	.28	.30	.28

Company.	Apr. 18 H.	Apr. 18 L.	Apr. 19 H.	Apr. 19 L.
Jack Pot	.09	.05	.09	.05
Last Dollar			.45	.40
Mollie Gibson	.05½	.05	.05¼	.04⅝
Moon Anchor	.09	.07½	.09	.07½
Old Gold	.13	.11¼	.11¾	.11½
Pharmacist	.03⅞	.03¼	.03⅝	.03½
Portland	1.80	1.70	1.80	1.70
Vindicator	.74	.69½	.75	.74
Work	.07¼	.07	.07¼	.07

SAN FRANCISCO.

Company.	Location.	Apr. 7 H.	Apr. 7 L.	Apr. 8 H.	Apr. 8 L.	Apr. 9 H.	Apr. 9 L.	Apr.11 H.	Apr.11 L.	Apr.12 H.	Apr.12 L.	Apr.13 H.	Apr.13 L.	Sales
Central Eureka	Cal													
Golconda	Ore.													
Golden Anchor	Nev.													
Hannapah	Nev.													
Lightner Mg. Co.	Nev.													
MacNamara	Nev.											.18	.16	4,000
Mont. Tonopah	Nev.	1.42½	1.35	1.42½	1.37½	1.47½	1.45	1.47½	1.45	1.45	1.42½	1.45	1.40	4,750
Penna. C. M. Co.	Cal													
South Eureka	Cal													
Ton. Belmont	Nev.							.60		.60		.60	.59	3,800
Ton. Midway	Cal	.37			.37		.37					.37		3,700
Ton. Mg. Co.	Nev.						8.00						.38	300
Ton. North Star.	Nev.	.32										.30		700
Ton. & Salt Lake.	Nev.													
Ton. Superior	Nev.													
Wild Goose	Ala.													

San Francisco and Tonopah Mining Exchange.
Total sales, 17,250 shares.

SAN FRANCISCO (By Telegraph).

Company.	April 18.	April 19.
Belcher	.34	.32
Best & Belcher	2.00	1.85
Caledonia	.72	.73
Challenge Con	.28	.24
Chollar	.25	.25
Confidence	.99	1.05
Con. California & Virginia	1.70	1.75
Crown Point	.17	.16

Name of Company.	April 18.	April 19.
Gould & Curry	.30	.31
Hale & Norcross	.85	.85
Mexican	2.10	2.20
Ophir	5.37½	5.62½
Overman		.37
Sierra Nevada	.68	.71
Union Con	.89	.93
Yellow Jacket	.27	.24

STOCK QUOTATIONS

MEXICO.* Apr. 8

Company.	Shares Issued.	Prices. Bid.	Ask.
Durango:			
Ca. Min. de Penoles..	2,500	$3,800	$3,830
San Andres de la Sierra	200	10,000	.....
Guanajuato:			
Angustias, Pozos....	2,400	45	50
Cinco Senores y An., aviadoras	2,000	44	48
Cinco Senores y An., aviada	400	40	50
Providencia, San Juan de la Luz	6,000	69	70
Queensland y Australia	300	55	75
Guerrero:			
Delfina, 1st serie....	2,500	52	56
Delfina, 2nd serie....	2,500	35	40
Garduno y Anexas...	7,200	30	40
Hidalgo:			
Amistad y Condordia	9,600	83	84
Carmen, aviada	1,100	50	90
Guadalupe Fresnillo Mill	1,000	170	200
Guadalupe Fresnillo Mine	1,400	70	80
La Blanca, aviadora.	1,530	.....	.....
La Blanca, aviada....	768	.....	.....
La Reina y An., aviadora	5,600	5	8
Luz de Maravillas, aviadas	1,100	.....	20
Maravillas y An., aviador	1,680	120	140
Maravillas el Lobo ..	1,000	130	180
Palma y An., aviador	1,800	8	16
Real del Monte	2,554	.....	.....
Refugio, aviada	12,800	680	740
Santa Anay An., aviadora	1,800	80	90
Santa Anay An., aviada	600	30	40
Sta. Gertrudis y An., aviadas	9,600	13	15
Sta. Gertrudis y An., aviadora	28,800	83	85
Santo Tomas Apostol aviadoras	5,100	2	3
San Felipe de Jesus, aviadora	3,600	16½	19
San Felipe de Jesus, aviada	1,200	6	10
San Rafael y An., Trompillo	1,200	1,710	1,725
San Rafael y An., aviada	1,200	670	680
Soledad, aviada	670	675	690
Sorpresa, aviada	960	280	285
.....	.....	.....	.....

Name of Company.	Shares Issued.	Prices. Bid.	Ask.
Mexico:			
Alacran	2,400	20	28
Aldebarren	2,000	20	30
Buen Despacho	3,000	38	40
Dos Estrellas	3,000	1,800	1,950
La Esperanza (El Oro.)	3,000	1,500	1,500
La Reformia, aviadores	2,000	21	25
Providencia, pagadoras	1,600	.....	.....
Providencia, liberadas	900	.....	.....
Santa Ana, Esperanza	2,400	90	.....
Michoacan:			
Luz de Borda, aviadora	3,000	50	55
Luz de Borda, aviado	1,000	25	33
Santiago y An., Tlal..	4,000	4	6
Nuevo Leon;			
La Fraternal	1,000	580	620
Norias de Bajan	1,000	880	920
San Luis Potosi:			
Concepcion y An.	3,000	60	65
El Barreno, aviadora.	2,000	58	65
Sta. Maria de la Paz..	9,800	170	175
San Diegoy Annexas.	2,400	8	10
Zacatecas:			
Asturiana y An.	2,500	20	30
Candelaria y Pinos..	2,500	130	140
Cubiertas	2,400	.....	.....
Esperanza y An.	2,400	6	8
Lourdes	2,500	22	27
Luz de Minillas, pagadoras	2,000	15	30
Nueva Quebradilla, aviadoras	2,400	20	40
Nueva Quebradilla, aviadas	600	20	40
San Carlos y Annexas	2,500	65	70
Sta. Maria de Gaud..	2,500	60	70
Miscellaneous:			
Bartolome de Medina	2,000	78	84
Guadalupe Hacienda	20,000	.....	.....
La Luz Hac. (Pachuca.)	3,750	.....	.....
La Reina (Chihuahua.)	192	.....	.....
Naica (Chihuahua.)..	100	11,000	13,000
Natividad (Oaxaca) aviadora	1,800	950	100
Natividad (Oaxaca) aviadas	600	.....	70
San Francisco Hac...	6,000	65	70
Santa Ana Huantla Morelos	4,000	.....	.....
Union Hacienda	3,000	215	230

*Values are in Mexican currency.

TORONTO, ONT. April 16

Company.	Par val	Prices. High.	Low.	Sales
Black Tail, g.	$1	.....	.....	.....
Cariboo-McKin	1	.....	.....	.....
Cariboo-Hydr.	1	.....	.....	.....
Center Star, g. s.	1	.30	.26	.....
Crows Nest, C.C.	100	.....	.....	.....
Dominion Coal	100	.....	.....	.....
Dominion S. & I.	100	.....	.....	.....
Fairview, g. s.	1	.....	.....	.....
Giant, g. s.	1	.....	.....	.....
Deer Trail, g. s.	1	.....	.....	.....
Iron Mask, g. s.	1	.....	.....	.....
Morrison, g. s.	1	.....	.....	.....
.....	.....	.....	.....	.....

Company.	Par val	Prices. High.	Low.	Sales
Granby Smelter...	$10	.....	.....	.....
Mountain Lion, g.	1	.....	.....	.....
North Star, g. s...	1	.....	.....	.....
Nova Scotia Steel..	100	.....	.....	.....
Payne, s. l.	1	.11	.07	.....
Rambler Carib ...	1	.28	.24	.....
Republic, g.	1	.....	.....	.....
St. Eugene, g. s...	1	.50	.36	.....
Virtue, g. s.	1	.....	.....	.....
War Eagle Con.	1	.12	.09	.....
Sullivan, g. s.	1	.....	.....	.....
Winnipeg, g. s.	1	.....	.....	.....
Wonderful, g. s..	1	.....	.....	.....

g—Gold. l—Lead. s—Silver. Total sales, none.

SALT LAKE CITY.* April 16

Company	Par Val	High	Low	Sales.
Ajax	10	.....	.....	.....
Bullion-Beck	....	1.50	1.50	100
Butler Liberal.	....	.14	.11¾	3,875
Carisa	....	.06	.06	1,500
Century	1	.....	.....	.....
Con. Mercur	1	.51	.45	4,550
Daly	20	2.45	2.35	300
Daly-Judge	....	4 25	4.00	450
Daly West	½	24.50	21.25	685
Grand Central.	....	4.30	4.30	300
Little Chief	....	02	.02	1,000
Ingot	1	.....	.....	.....
Joe Bowers	....	.....	.....	.....
.....	.....	.....	.....	.....

Name of Company	Par Val	High	Low	Sales.
L. Mammoth..	½	.....	.....	.....
Mammoth	....	.05⅞	.05⅜	4,000
May Day	....	.01⅝	.01½	27,500
Martha Washa..	....	.18½	.17½	2,500
N. Y. Bonanza	5	.12	.09	7,400
Sacramento	....	.63	.03	500
Silver Shield	1	.47½	.07¼	500
So. Swansea	....	.27½	.23¾	12,000
Star Con	....	.14½	.13¾	5,200
Tetro	....	.20	.19½	100
Uncle Sam, Con	1	.55	.55	1,000
Utah	....	.41	.40½	.....
Wabash	....	.....	.....	.....
Yankee Con	....	.....	.....	.....

*By our Special Correspondent. All mines are in Utah. Total sales, 73,220 shares.

PHILADELPHIA, PA

Company.	Par val.	Apr. 13 H.	L.	Apr. 14 H.	L.	Apr. 15 H.	L.	Apr. 16 H.	L.	Apr. 18 H.	L.	Apr. 19 H.	L.	Sales
Am. Cement.	$10	7⅛	7⅛	7⅛	.....	7⅜	.....	7⅜	.....	.....	.....	.....	.....	157
Cambria Iron	50	.....	.....	.....	.....	.....	.....	46	.....	.....	.....	.....	.....	24
Cambria Steel	50	20¼	.....	20¼	20	.....	.....	20¼	20	20¼	20	.....	.....	327
Pa. Steel, pfd	100	80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	68
Susq. I. & S..	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United Gas I.	50	84	83⅞	83¾	.....	83½	.....	83¾	.....	83¼	83	83	.....	294
Lehigh Nav'n	50	67	.....	67⅛	.....	67⅛	.....	68	.....	68	.....	68	.....	484
Philadelphia .	50	38¾	38⅝	38¼	.....	38½	38⅛	38⅛	.....	38⅝	.....	38⅛	38⅜	1,240
*U.S. Steel....	100	.....	.....	113⅜	113⅛	113¼	113⅛	113¼	.....	113¼	.....	11	.....	2,305
U.S. Steel. pf.	100	61	60½	61⅜	60⅜	60¾	60⅜	60⅝	60¼	60¾	58⅞	59¼	57⅞	9,304

*Ex-dividend. Total sales 14,203.

LONDON. April 8

Company.	Shares Issued.	Par value. £.	s.	d.	Latest dividend. Amt. s.	d.	Date.		Quotations. Buyers. £	s.	d.	Sellers. £	s.	d.
American:														
Alaska-Treadwell	200,000	5	0	0	3	0	Apr.,	1904	4	7	6	4	12	6
Anaconda	1,200,000	5	0	0	2	0	Nov.,	1903	3	18	9	4	1	6
Camp Bird	820,000	1	0	0		9	May,	1904	1	5	0	1	6	3
Copiapo	112,500	2	0	0	6	10	May,	1903	1	0	0	1	5	0
De Lamar	80,000	1	0	0	2	0	Oct.,	1903		11	3		13	9
El Oro	1,080,000	1	0	0		9	Jan.,	1904	1	1	3	1	3	9
†Frontino & Bolivia	128,662	1	0	0	3	0	July,	1901		10	0		12	6
Le Roi	200,000	5	0	0	5	0	Nov.,	1899	1	7	6	1	10	0
Le Roi No. 2	120,000	5	0	0	1	0	Feb.,	1904		16	3		18	9
Montana	657,128	1	0	0		6	April,	1899			9		1	0
Palmarego & Mexican	445,000	1	0	0	rts.		April,	1903		7	6		8	0
Standard	500,000		4	0		2½	Sept.,	1903		2	0		3	0
Stratton Independence.	1,000,007	1	0	0		6	Dec.,	1903		3	9		4	3
St. John del Rey	546,265	1	0	0		6	Dec.,	1903		14	6		15	0
Tomboy	300,000	1	0	0	1	0	June,	1902	1	5	0	1	10	0
Ymir	200,000	1	0	0	1	0	Mar.,	1902		1	3		3	9
European:														
*Linares	15,000	3	0	0	5	0	Mar.,	1904	3	15	0	4	5	0
Mason & Barry	185,172	1	0	0	11	0	May,	1903	3	15	0	4	0	0
Rio Tinto	325,000	5	0	0	37	6	Apr.,	1904	52	17	6	53	2	6
Rio Tinto, preferred	325,000	5	0	0	2	6	Apr.,	1904	6	0	0	6	5	0
*Tharsis	625,000	2	0	0	7	0	May,	1904	4	12	6	4	17	6
West Australian:														
Associated	495,388	1	0	0	2	0	Jan.,	1904	2	7	6	2	8	9
Cosmopolitan	400,000	1	0	0	1	0	May,	1903		14	3		14	9
Golden Horseshoe	300,000	5	0	0	6	0	Apr.,	1904	8	6	3	8	8	9
*Great Boulder	1,750,000		2	0		9	Mar.,	1904	1	6	0	1	6	6
Gt. Boulder Persever'ce	1,400,007	1	0	0	1	3	Feb.,	1904	1	4	0	1	4	6
Great Fingall	250,000	1	0	0	7	0	Apr.,	1904	8	8	9	8	11	3
Ivanhoe	200,000	5	0	0	7	6	Apr.,	1904	8	11	3	8	13	9
Kalgurli	120,000	1	0	0	2	6	Apr.,	1904	5	10	0	5	12	6
Lake View	250,000	1	0	0	rts.		Aug.,	1902	1	0	0	1	2	6
*Oroya-Brownhill	450,000	1	0	0	2	6	Mar.,	1904	3	7	6	3	8	9
Miscellaneous:														
*Brilliant Central	100,000	1	0	0	1	0	Apr.,	1904	2	17	6	3	2	6
Briseis	600,000	1	0	0	..	..				7	6		8	6
Broken Hill	960,000		8	0	1	6	Feb.,	1904	1	14	0	1	15	0
Mt. Lyell	275,000	3	0	0	4	3	Sept.,	1903		18	6		19	6
Mt. Morgan	1,000,000	1	0	0		3	Apr.,	1904	2	2	6	2	5	0
Waihi	497,412	1	0	0	2	6	Mar.,	1904	5	7	6	5	10	0
Indian:														
Champion Reef	513,832		10	0	6	6	Jan.,	1904	1	15	0	1	16	3
Mysore	566,043		10	0	5	6	Mar.,	1904	6	6	3	6	8	9
*Nundydroog	484,000		10	0	1	8	Mar.,	1904	1	15	0	1	17	6
Ooregum	343,000		10	0	1	3	Apr.,	1904	1	0	0	1	2	6
Ooregum, pfd	240,000		10	0	1	3	Apr.,	1904	1	8	9	1	11	3
South African:														
Angelo	600,000	1	0	0	4	0	Feb.,	1904	6	7	6	6	12	6
Bonanza	200,000	1	0	0	10	0	Feb.,	1904	1	15	0	1	17	6
British South Africa	4,436,019	1	0	0	rts.		May,	1899	1	13	9	1	15	0
Cape Copper	300,000	2	0	0	4	0	Jan.,	1904	3	0	0	3	5	0
Cape Copper, pfd	75,000	2	0	0	1	9	Jan.,	1904	2	15	0	3	0	0
City & Suburban	340,000	4	0	0	8	0	Feb.,	1904	6	11	3	6	13	9
Consol. Gold-Fields	2,000,000	1	0	0	..	..			6	1	3	6	3	9
Crown Reef	120,000	1	0	0	18	0	Apr.,	1904	17	0	0	17	10	0
*De Beers, preferred	800,000	2	10	0	10	0	Jan.,	1904	18	11	3	18	13	9
*De Beers, deferred	1,000,000	2	10	0	15	0	Jan.,	1904	19	17	6	20	0	0
East Rand	980,000	1	0	0	5	0	Aug.,	1903	6	18	3	6	18	9
Ferreira	90,000	1	0	0	3	0	May,	1904	19	15	0	20	5	0
Geldenhuis	200,000	1	0	0	6	0	Feb.,	1904	5	6	3	5	8	9
Geduld	400,000	1	0	0	rts.		Mar.,	1902	5	18	9	6	0	0
Henry Nourse	125,000	1	0	0	10	0	Feb.,	1904	8	15	0	9	0	0
Jubilee	50,000	1	0	0	5	0	Feb.,	1904	4	10	0	4	15	0
Jumpers	100,000	1	0	0	2	6	May,	1904	2	13	9	2	16	3
Langlaagte	470,000	1	0	0	2	0	Feb.,	1904	3	10	0	3	12	6
May	288,750	1	0	0	3	6	Feb.,	1904	3	17	6	4	0	0
Meyer & Charlton	100,000	1	0	0	5	0	Jan.,	1904	5	0	0	5	5	0
Modderfontein	200,000	1	0	0	rts.		Apr.,	1902	8	8	9	8	11	3
Namaqua	94,331	2	0	0	3	0	Dec.,	1903	3	0	0	3	5	0
New Jagersfontein	200,000	5	0	0	10	0	Apr.,	1904	27	15	0	28	5	0
*New Primrose	325,000	1	0	0	3	0	Mar.,	1904	3	12	6	3	15	0
Rand	1,795,956		5	0	4	0	Aug.,	1902	9	15	0	9	17	6
Robinson	750,000	5	0	0	5	6	Feb.,	1904	9	7	6	9	12	6
Robinson Deep	950,000	1	0	0	3	0	Jan.,	1904	5	6	3	5	8	9
Rose Deep	425,000	1	0	0	2	6	Feb.,	1904	7	17	6	8	0	0
Salisbury	100,000	1	0	0	2	0	Mar.,	1899	1	12	6	1	17	6
Village	400,000	1	0	0	3	0	Feb.,	1904	6	8	9	6	11	3
Wemmer	80,000	1	0	0	10	0	Jan.,	1904	10	0	0	10	10	0

*Ex-dividend. †Ex-rights.

LONDON (By Cable.)*

Company.	Apr. 13 £.	s.	d.	Apr. 20 £.	s.	d.	Company.	Apr. 13 £.	s.	d.	Apr. 20 £.	s.	d.
Anaconda	4	0	0	3	15	0	El Oro	1	1	3	1	2	6
British So. Africa.	2	2	6	2	1	3	Modderfontein	5	6	3	9	5	7½
Camp Bird	1	5	9	1	6	0	Rand Mines	10	3	9	10	6	3
Con. Gold Fields.	6	13	9	6	11	3	Rio Tinto	52	17	6	52	15	0
De Beers	19	12	6	19	12	6	Simmer & Jack	1	14	9	1	15	7½
East Rand	7	9	4½	7	11	10½	Tomboy	1	7	6	1	7	6

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. Mar. 31

Company.	Location.	Capital Stock. Francs.	Par value. Fr.	Latest divs. Fr.	Prices. Opening. Fr.	Closing. Fr.
Anzin, Coal	France	.....	.....	290.00	5,330.00	5,410.00
Boleo, c	Lower Cal.	12,000,000	500	62.50	1,755.00	1,880.00
Champ d'Or, g	S. Africa	3,375,000	25	3.75	17.00	18.50
Courrieres, Coal	France	600,000	500	110.00	2,730.00	2,725.00
Fraser River, g	Brit. Col.	250,000	25	.....	5.50	5.50
Huanchaca, s	Bolivia	40,000,000	125	2.50	66.25	80.75
Laurium, z. l.	Greece	16,300,000	500	25.00	316.00	317.00
Malfidano, z	Italy	12,500,000	500	50.00	585.00	590.00
Metaux, Cie. Fran. de	France	25,000,000	500	22.50	470.00	469.00
Mokta-el-Hadid, i. l.	Algeria	18,312,000	500	40.00	875.00	880.00
Nickel, n	N. Caledonia	15,000,000	500	22.50	520.00	535.00
Penarroya, Coal	Spain	.....	500	45.00	1,089.00	1,084.00
Vielle Montagne z	Belgium	9,000,000	50	30.00	690.00	693.00
.....	.....	.....	.....	.....	.....	.....

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.

ST. LOUIS, MO.* April 16

Name.	Par Val.	Prices. Bid.	Ask.	Name.	Par Val.	Prices. Bid.	Ask.
Am.-Nettie, Colo.	$10	$0.15	$0.25	Columbia Lead, Mo.	$10	$3.50	$4.50
Catherine Lead, Mo.	10	1.40	2.50	Con. Coal, Ill.	100	17.00	18.00
Central Coal & C.	100	60.00	61.00	Doe Run Lead Mo.	100	110.00	115.00
Central C. & C., pf.	100	71.00	72.00	Granite Bimet. Mt.	10	.35	.40
Central Lead, Mo.	100	110.00	115.00	St. Joe Lead, Mo.	10	14.50	16.00

*By our Special Correspondent.